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Subscriptions
UK £10 for 12 issues
Overseas (surface) £16 for 12 issues

ISSN 0265 0177 Telex 296275
Dragon User 12-13 Little Newport Street London WC2H 7PP

US address c/o Business Press International 205 East 42nd St New York, NY 10017

ABC

Published by Sunshine Books, Scot Press Ltd. © Sunshine Books 1985
Typesetting by Chesham Press, Chesham Bucks. Printed by Eden Fisher (Southend) Ltd, Southend-on-Sea, Essex
Distributed by S M Distribution London SW9 01 274 8611 Telex 261643

Registered at the Post Office as a newspaper

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How to submit articles

The quality of the material we can publish in *Dragon User* each month will to a very great extent depend on the quality of the discoveries that you can make with your Dragon. The Dragon computer was launched on to the market with a powerful version of Basic but with very poor documentation.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should whenever possible be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped addressed envelope.

Contents

Letters 4

Manic Miner query, pen friend wanted, Sheffield Dragon Users Group, US Plea, Top Ten critic and more

News 7

6809 Show, new software, Compusense importing 64s and Dragon speech synthesised

Artist 10

A drawing utility for the Dragon written by Brian Hinson

Battleships 12

Search and destroy the enemy's ships with this month's Star Game from Mark Beckham

Forth Protocol 16

Mark Varney explains the programming language Forth

Software Reviews 21

New games and utilities for the Dragon reviewed by our panel of experts

Soundbox 22

Pam D'Arcy shows how to teach your Dragon to talk

Open File 29

This month's programs are Heartbeat — which shows if you are dead or not — and Conversion, a metric-imperial conversion routine

Adventure Trail 35

Mike Gerrard goes to the Circus and enjoys a holiday in the strangely familiar Terror Castle

Dragon Answers 41

Brian Cadge with his advice for agonised Dragon owners

Competition Corner 42

Four Dragon 64s from Compusense can be won by solving a million problems — or is it a problem about a million? — set by Gordon Lee

Editorial

HOW ARE THE mighty fallen! Acorn, once the darling of the Unlisted Securities Market, has been forced to restructure itself with financial aid from Italian giant Olivetti. Commodore UK has halved the price of its new Plus/4 micro and parted company with its general manager Howard Stanworth. Even Sinclair has cut back on production and postponed the US launch of the QL.

Nor is this phenomenon confined to the UK. Sord, once described as the "Japanese Apple", has been in discussions with Toshiba about possible investment. This follows a sharp drop in profits last year and a reduction in market share to little more than four per cent.

The micro market can fairly be described as "jittery" at the moment. The boom years of 1980-83 are over and no one is quite sure how big the market will be in future. This, in turn, has had a knock-on effect among book and software publishers.

Dragon users, of course, are quite familiar with this situation having experienced the troubles associated with Dragon Data's demise. Thus, they are well placed to advise their fellow micro owners that all is not "doom and gloom". Any machine which establishes a large user base will continue to be served by software and peripherals for some time, even if the manufacturer ceases to exist.

Hopefully, once excess production capacity has been shed, the market will settle down again. The question occupying most peoples' minds at the moment is just how much capacity is excess — no one is taking any bets on the answer.

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Son et lumiere

I AM writing with reference to the Sound-to-Light program by Robert Strange published in *Dragon User* in January. This program can be improved by altering the following lines

```
120 T=500
140 C=INT(A/7)
150 IF C=O THEN T=T*2 1
160 IF C>=8 THEN C=8 T=T*2 1
170 IF T>1100 THEN T=1100
180 IF ABS(A-E)<O THEN 130
210 E=A IF E=O THEN CLSO
```

The program will now respond much faster to the changes in pitch in the music.

Peter Davis
95 Curzon Road
Bradford Moor
Bradford
West Yorkshire

Avoid the SAM sting

I RECENTLY had the misfortune to blow the 6883 SAM chip in my Dragon. The symptoms on cold start are a screen full of characters which are unaffected by inserting a cartridge, resetting or using the keyboard.

Attempts to buy this semiconductor from my local dealers proved fruitless. All the dealers in an electronics magazine also failed to stock this item. Eventually I found two electronic stockists who carried this chip. The sting was the price of £33.62.

An advertisement in an American magazine showed that I could obtain one cheaper in Silicone Valley. A Visa order placed on an After Eight phone call to DOKAY Computer Products in Santa Clara, Los Angeles and five days later the chip was delivered to my home for a total cost of £19 plus postage. Quite a saving!

Mike Corrigan
Formby
Merseyside

Readers' poll plea

I WONDER on what basis your software Top 10 is calculated? By far the best games for the Dragon (namely Tim Love's *Cricket* by Peaksoft, *Back Track* by Incentive and *Return of the Ring* by Wintersoft) have never even registered in this chart, which I should imagine is based on shop sales! Well, you try getting a new Dragon game in any shops?!

Surely a better way would be to run a readers poll a la *Popular Computing Weekly*, then I'm sure these great games would attain their right ful position at the top of the Dragon charts.

W Miles
37 Clarence Road
Fleet
Hampshire RG9 7AQ

TOP 10 charts and their accuracy or lack of, have long been a subject of debate. But it is true that many shops have shown a marked reluctance to stock new Dragon software following Dragon Data's demise. We would be very interested to know what other readers think about the idea of a readers' poll.

Sheffield shuffle

I THOUGHT I ought to write to correct a notice given in a recent issue of *Dragon User*. It concerns the Sheffield Dragon User group. Your last Dragon Clubnet showed us as the OS9 user group of Huddersfield.

I have had a number of calls concerning OS9 (which have been welcomed, since I actually use OS9 myself) but the club does not specialise in OS9. One of the calls was of interest however, since the gentleman concerned was willing to answer further enquiries regarding OS9. His details are as follows

Alan Kendrick
5 Henry Avenue
Havercroft, Nr Wakefield

I would be grateful if you could update our club details — we now meet only at Sheffield City Polytechnic (during term time) on the last Monday of each month. Incidentally you may be interested to know that I have had enquiries from places such as Ireland and Germany! Your magazine certainly gets about.

Richard Crampton
Sheffield Dragon &
CoCo Users Group
131 Herringthorpe Valley Rd
Rotheram

APOLOGIES TO the Sheffield Dragon User group for placing you in Huddersfield.

Americans Dragons

THIS IS a plea from an unknown number of Dragon owners in the USA. We have been left with no peripheral or software support after the Tano Corporation unsuccessfully tried to crack the overcrowded American market place.

Any articles aimed at US readers would be most appreciated. In particular we need information on foreign mail order problems and on the possibility of interfacing Color Computer disk drives and controllers. Any personal information and advice from your readers would be welcomed.

Ricky Berkey
229 Elva
Anderson
IN 46014
USA

Software Top 10

1	(5)	**Chuckle Egg**	A & F
2	(4)	**Dragon Chess**	Oasis
3	(–)	**Frogger**	Microdeal
	(–)	**Cuthbert In Space**	Microdeal
	(7)	**Bug Diver**	M Tronic
	(2)	**Mystery of Java Star**	Shards
	(–)	**Back Track**	Incentive
	(–)	**O Level Maths**	Ampsoft
9	(–)	**Dragon Fly**	Hewson
	(–)	**Pedro**	Beau Jolly
	(–)	**Database**	MST
	(–)	**Edit+**	Compusense

Chart compiled by Websters Software

Dragon miners

COULD YOU please tell me where I can get a copy of *Manic Miner* for the Dragon? I have searched everywhere but failed to find it. Hope to hear from you soon.

Conor Wymberry

IF YOU can't find a copy in your local shops, you can always buy the game mail order from Software Projects, PO Box 12, Liverpool L25 7AF

Key friend

I WOULD like to congratulate you on your excellent magazine *Dragon User*. It is a great relief to see a magazine devoted solely to the Dragon even though the company went bust. I buy a copy every month.

I am writing to ask you to publish my name and address as I would like a computer pen friend.

Andrew Bartlett
30 The Moors Drive
Middleton Cheney
Banbury
Oxon

Flex

RE GO FLEX by Brain Cadge — *Dragon User* February — this article was unfair in that Brian expressed a personal preference for OS9 which some readers have take as an unqualified recommendation. No factual comparison of OS9 and FLEX facilities were made to justify this opinion. Some of our customers who have bought and used both systems were outraged at such a shallow review. I note that a recent review by Radio West came down heavily in favour of FLEX and DBASIC.

I feel that you owe Dragon users a more detailed comparison of the two operating systems. Both have their virtues and are well worth examining in detail. It is a tribute to the power and versatility of the 6809 processor that two such excellent operating systems are available.

Stan Opyrchal
Compusense

If you're into program writing....

Get this into an envelope

If the programs you are writing involve sophisticated graphics, you have two choices, a severe headache or Touchmaster.

Obviously you'll want to consider the matter, so in the mean time send away for your free Touchmaster literature and find out more about the best value/performance graphics tablet available . or take two pain killers!

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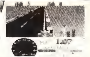

NEW FROM MICRODEAL
ORAGON 32/64 & TANDY COLOUR 16K

ATHLETYX

Here s the one everybody with a Dragon or Tandy has been waiting for A track and field game for 1 or 2 athletes with great graphics and 6 arm wrenching incredibly tiring events
1 Joystick required
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Cuthbert in the Cooler

Cuthbert s been zapped back in time to World War II and whats worse into a prisoner of war camp So our elusive hero has to escape Firstly he must try and grab the keys from the drunken guards and make a dash for the main doors – then he must find some papers and leg it through the mine field then the ferry and much much more 100% machine code Hi Res Graphics 1 Joystick required
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6809 Show

THE SECOND 6809 Colour Show for Dragon and Tandy users will be held at London's Royal Horticultural Halls on March 30 and 31 Exhibitors will include Tandy Microdeal Compusense Design Design Blaby and Voltmace

A new modem for the Dragon will be launched by Dealer Deals The Demon modem can handle baud rates from 300 to 1200 and will cost around £50 The price of the accompanying software has not yet been fixed

Dragon User will be exhibiting on stand No 45 46 There will be a wide selection of current and back issues of the magazine on display together with a number of Dragon books from Sunshine all for sale to the public

Admission to the show which will be open from 10 am to 6 pm will cost £2 for adults and £1 for children under 12 Further information is available from the show organisers Computer Marketplace (Exhibitions) Ltd 20 Orange Street London (Tel 01-930 1612)

Last November's 6809 Show — busy as ever

Jet Set Dragon

IF YOU have ever tried to climb the Banyan Tree get under the Security Guard or perform a Quickafleeg then the chances are that you have played *Jet Set Willy* on a Spectrum Now Software Projects is launching *Jet Set Willy* on the Dragon

Jet Set Willy s the sequel to *Manic Miner* and again features the adventures of Miner Willy The game is set in Willy's mansion and there are some 60 locations to explore each with their own hazards and hidden surprises Watch out for guards on the battlements and the entrance to Hades

Matthew Smith's epic which was converted to the Dragon by Roy Coates costs £7 95 and is available from Software Projects Allerton Road Woolton Liverpool L25 7SF

Dragon roars

A SPEECH synthesiser for the Dragon is being retailed by J Morrison (Micros)

The Speakeasy synthesiser plugs into the printer port and is powered from the micro It has a built-in speaker and will come with two software packages to demonstrate its capabilities

The package will cost £24 95 from J Morrison (Micros) Dept DU385 4 Rein Gardens Tingley West Yorkshire WF3 1JR

Speakeasy
Speakeasy
THE MICRO SPEECH MODULE

Compusense imports Dragon 64s

EUROHARD has appointed London based Compusense as its UK Dragon distributor Compusense is now shipping Dragon 64s and Dragon disk drives for sale in the UK Single disk drives will cost around £240 and double disk drives about £450 The price of the Dragon 64 has been fixed at around £195 All prices inclusive of delivery

Both the Dragon 64 and the disk drives will be on sale at the Compusense stand at the 6809 show on March 30 and 31 at London's Royal Horticultural Halls

More information from Compusense Box 169 286D Green Lanes Palmers Green London N13 5XA

New releases

BLABY Computer games will be showing four new releases at the 6809 Show

Copter Snatch based on *Scramble Star Swoop* a version of *Galaxian* and *Star Defence* a *Defender* type game are all £1 99

The fourth game *Hubert* is a version of *Q-Bert* and will cost £3 99

John Bailiss the company's managing director says that a video display will be running full time at the show to allow customers to take a look at the programs before buying

A copy of the demo video has also been sent to Justo Alverez of Eurohard

Mysterious

THE Mysterious Adventure series originally released by Channel 8 will now be put out by Adventure International publishers of the Scott Adams range of adventures

This follows the announcement that Brian Howarth author of the Mysterious Adventures has joined AI to head the programming team

He will be working on Dragon conversions of the entire AI range — *Spiderman* will be next followed by a *Gremlins* game

The Mysterious Adventure games are £7 95

Mastertronic

MASTERTRONIC is converting its successful one armed bandit simulation *Vegas Jackpot* for the Dragon It will be in the budget range at £1 99 and will appear towards the end of March

Screaming Abdabs

LANCASHIRE BASED A&F Software has just released a new program for the Dragon — *Screaming Abdabs* There are 35 complex screens with various monsters icicles collapsing floors and other hazards to prevent you from reaching your goal

Each screen contains a key which is necessary to access the next level

The game which costs £6 90 is available from A&F Software Unit 8 Canalside Industrial Estate Woodbine Street East Rochdale Lancashire OL16 5LB

A&F
DRAGON
SCREAMING ABDABS

Incentive Confuzion

THE NEXT Dragon program from Incentive Software will be a version of the arcade game *Confuzion* £6 95

Ian Andrew Incentive's managing director says that *Confuzion* will be converted as soon as the programmer has finished the *Kel* Trilogy

For more details contact Incentive Software 54 London Street Reading RG1 4SQ

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DASM/DEMON

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EDIT +

EDIT+ is a Full Screen Editor and Programmer s Tool Kit It s an excellent aid for writing programs in BASIC and is easy to use for the novice as well as the experienced programmer EDIT+ includes all the facilities of Hi RES Up to 23 lines of your program are displayed on the screen and can be changed by overtyping inserting or deleting characters Functions include Find String Change String Copy Text Goto Specified Line Scroll up Down Append From Tape and Enter Basic Command No Dragon is complete without an EDIT+

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Dragon DOS disk £24 00
Dragon FLEX Disk £19 95

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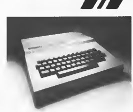

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Artist

__Brian Hinson__ explains how to turn your keyboard into an artist s palette

ARTIST IS a program for all the family to enjoy! You can just doodle away to your hearts content or you can use the save and load features to create screens for games and illustrations using all the bright colours from your Dragon

The program starts by clearing all the Dragon s high resolution screens It continues by asking questions to set up the Pmode Screen Start page and Colours you want to use The colours you choose for your background and pen must be from those available in the Pmode you have set (refer to page 96 of the manual) Joystick or keyboard control is included Keyboard control is easier to use for fine control but joysticks are better for speed Try experimenting for yourself

You should now have a small flashing dot that you can move around the screen Press C for control and the computer will Beep whilst waiting for a command Now press I for ink and the dot will leave a line of your pen colour To change colour press C followed by the code number for the colour you want (eg 4 = red in Pmode 3)

If you want a line at a difficult angle or to join two points you need to enter Box mode Position the dot at one end of the line and press C — B Dragon will remember this point When you are ready position the dot at the other end of the line required and press C — B — L and your line will appear

Box mode is also used to draw squares and rectangles First register the starting point as before then move to the diagonally opposite corner and press C — B — B Hey presto! a box Make sure you have not left a hole at the corner and you can paint it Move your dot inside and press C — P — followed by the number code for the paint you want (eg 2 = Yellow) Box mode is also used to pick up some part of your picture however big and PUT is elsewhere As before register the diagonal corners C — B then C — B — G and the box will be remembered in array F (see line 90)

Did you know that you only need 1/32nd of the memory reserve the Dragon manual says you need for GET and PUT routines on pages 120/1? You don t need to worry about this to use artist but for use elsewhere remember your array size need only be x length multiplied by y length divided by 32 and rounded up to a whole number For example the whole screen in Pmode 3 is 255 × 191 = 48705 divide by 32 to get 1522 03 So you could DIMension an array F (1523) to pick up a whole screen s worth!

Having GOT your detail move the dot to the top left corner of the position you want to PUT it in and press C — G the detail appears If you need another copy of the same detail you only need to PUT it with another C — G and the array will continue to hold the same detail until the next time you use C — B — G

To draw a circle or ring press C — R followed by the radius you want As the control routine uses keyboard input direct I have used the ASC II value of the key pressed less 48 so you can have a circle of radius from 1 to 2 (ie 1 to 74)

Made a mistake? Use C — E to obtain an eraser and rub it out! Finished or want a rest? Press C — X and you will enter the save routine You will now be offered a choice of tape or print dumps The tape dump is supplied in listing 1 but you will have to add your own printer dump as a subroutine from line 1770 if you want this refinement

To recall your picture for use in another program include a line CLOADM picture and record the picture just after the program on the tape Now your picture will auto load probably much quicker than it could be drawn in Basic and using less memory

When you have become proficient at drawing you may wish to use the Perspective routine to create three dimensional pictures First decide on the vanishing point position the dot and press shift A target will appear and Dragon will remember its position even if you rub it out From now on any time you want a line of perspective press shift You will have to rub out the parts of the lines you don t want and things can get a little confusing but the results are super! If you are really advanced you can have two or more vanishing points by saving the part finished picture on tape - breaking the program run and reload the picture and establish a new vanishing point Have fun!

```
ARTIST by Brian Hinson

10  ***********ARTIST************
20
30  ***A DRAWING PROGRAM FOR****
40  ***ALL THE FAMILY TO USE****
50
60  *** BY br an Hinson 1984 ***
70
80  ****************************
90 CLEAR 200 PCLEAR 8 DIM F(1400)
100 PMODE4 1 PCLS PMODE4 5 PCLS PMODE3 1
110 CLS PRINT@160  DO YOU REQUIRE INSTRUCTIONS
    PRESS  I  IF
YOU DO IF NOT ANY  OTHER KEY WILL DO
120 K$=INKEY$ IF K$=   THEN 120
130 IF K$<> I  THEN 150
140 GOSUB 1400
150 K$   CLS6 PRINT@10  ARTIST   PRINT @ 96   DO
    YOU  WISH  TO  DRAW  A  NEW       PI TURE  OR
    RECOVER AN OLD ONE   FROM TAPE   (N/O)
160 N$=INKEY$ IF N$=   THEN 160
170 IF N$= O  THEN 1100
180 IF N$  N  THEN 190 ELSE SOUND 100 2 GOTO150
190
200 PRINT@226  JOYSTICK ^ (Y/N)
210 J$=INKEY$ IF J$=   THEN 210
220 IF J$  N  THEN J 0 GOTO270
230 IF J$<> Y  THEN 200
250 PRINT@226  USE RIGHT JOYSTICK "
260 J=1 GOTO 275
270 PRINT@226  USE ARROW KEYS
275 PRINT@290    INPUT PMODE (0 TO 4)     M
280 PRINT@322     INPUT START PAGE        P2
290 PRINT@354    INPUT       S REEN  I  ,S
300 IF N$= O  THEN L=1 GOTO 340
310   PRINT@386     INPUT BACKGROUND(0   TO   8
    FROM   COLOURS  AVAILABLE)        L
320 PMODEM P2
330 PCLSL
340 PRINT@450      INPUT              PEN ,LI
350 PMODE M P2 SCREEN 1 S
360 O=0 P=0
370 C L
380 PSET(O Y,LI)
390 K$=INKEY$ IF K$<> C  THEN 520
400 SOUND 100 1 K$=INKEY$ IF K$<>   THEN 410
    ELSE 400
410 COLOR LI,L E=0 IF K$= I  THEN C=LI GOTO 520
420 IF K$  O  THEN C L GOTO 520
430 IF K$= X  THEN 850
440 IF K$= R  THEN 1030
450 IF K$= E  THEN GOSUB 1240 GOTO 520
460 IF K$= H  THEN GOSUB 1400 SCREEN 1 S GOTO 520
470 IF K$= G  THEN GOSUB1730 GOTO 400
480 IF K$  B  THEN 1290
490 IF K$= P  THEN 770
500 IF ASC(K$) 58 AND ASC(K$)>47
    THEN C L LI ASC (K$) 48 C LI
510 IF K$  C  THEN 400
520
530 O1=O P1=P
540 IF E=1 THEN GOSUB 1240
550 PSET(O P LI)
560 IF J=1 THEN 620
570 IF PEEK(341) 223 THEN P=P-1
580 IF PEEK(342)=223 THEN P=P+1
590 IF PEEK(343)=223 THEN O=O 1
600 IF PEEK(344)=223 THEN O O+1
610 GOTO 670
620 H JOYSTK(0) V=JOYSTK(1)
630 IF H<8 THEN O=O-1
640 IF H>56 THEN O=O+1
650 IF V<8 THEN P=P-1
660 IF V>56 THEN P P+1
670 IF P<0 THEN P=0
```

```
680 IF P>191 THEN P=1
690 IF O<0 THEN O=0
700 IF O>255 THEN O=255
710 PSET(O1 P1 C)
720 A=PEEK(65280)
730 IF A=63 OR A 191 THEN 740 ELSE 750
740 GOSUB 1160
750 IF C=L THEN 760
760 IF INKEY$= C  THEN 400 ELSE 530
770 SOUND 50 1
780 PSET(O P L)
790 K$=INKEY$
800 IF K$    THEN 770
810 L2=ASC(K$) L2 L2 48
820 IF L2>8 OR L2<0 THEN L2=1
830 PAINT(O P) L2 L1
840 K$= C   GOTO 400
850 CLS4 PRINT    YOU STOPPED  IF YOU WISH TO
    SAVE YOUR MASTER PIECE THEN     PRESS
    ANY OTHER KEY WILL   RE-START
860 D$=INKEY$
870 IF O$=   THEN 860
880 IF D$= S  THEN 920
890 INPUT DO YOU WANT A CLEAN SCREEN (Y/N)   CS$
900 IF CS$  Y  THEN RCLS
910 N$= O" GOTO 200
920 CLS0 PRINT@129  DO YOU WANT TO SAVE ON TAPE?
930 K$=INKEY$ IF K$= " THEN 930
940 IF K$  Y  TNEN 990
950 PRINT@193  DO YOU WANT A PRINT ? ,
   PRINT@257
960 K$=INKEY$ IF K$=   THEN 960
970  IF  K$<> Y   THEN  PRINT"I  do not
     understand , FOR DL=1 TO 1000
     NEXT DL SOUND125 3  GOTO350
980 GOSUB 1770 GOTO 350
990 PRINT SET TAPE TO CORRECT AREA   MOTORON
   LINE INPUT WHAT  IS THE TITLE OF YOUR
   PICTURE?(UP TO 8 CHARACTERS) ,T$
1000 IF P2<1 OR P2>8 THEN P2=1
1010          CLS4 PRINT           RECORDING
    "T# CSAVEM  T$ (P2*1536) 13823 (P2*1536)
1020 PRINT I've finished"  SOUND  180 5 FOR
     DL 1  TO  1000 NEXT DL SCREEN1 S GOTO 380
1030 SOUND 70 1
1040 K$=INKEY$
1050 IF K$    THEN 1030
1060 R1 ASC(K$) R1 R1 48
1070 IF R1>100 OR R1<1 THEN R1=1
1080 CIRCLE(O P) R1 L1
1090 K$= C  GOTO 400
1100 'SUB TO LOAD PICTURE FROM TAPE
1110  CLS3 PRINT   SET TAPE TO CORRECT AREA
      MOTORON LINE INPUT  NAME OF PICTURE
      SOUGHT"  T$
1120 CLS4 PRINT LOADING PICTURE  T$
1130 PCLS SCREEN1 0
1140 CLOADM T$
1150 GOTO 200
1160 'SUB TO DRAW LINES OF PERS PECTIVE
      ************************
1170 SOUND50 2
1180 IF W<>0 THEN W=1 GOTO 1220
1190 O3=O R3=P CIRCLE(O3 P3) 4 L1
1200 W 1
1210 GOTO 1230
1220 LINE(O3 P3)  (O P) PSET
1230 A=PEEK(65280) RETURN
1240 'ROUTINE  TO ERASE*************
1250 C L
1260 LINE(O P)-(O+5 P+5),PRESET BF
1270 IF E=0 THEN E=1
1280 RETURN
1290  ROUTINE TO DRAW BOXES
1300 IF B1=0 THEN 1390
1310 O$=INKEY$ SOUND 230 1
1320 IF O$    THEN 1310
1330 IF O$= B  THEN 1370
1340 IF O$  G" THEN GOSUB 1680 B1=0 GOTO 520
1350 IF O$="L  THEN 1360 ELSE 1310
1360 LINE(O P)-(O4,P4),PSET GOTO 1380
1370 LINE(O,P)-(O4 P4) PSET B
1380 B1 0 O4 0 P4=0 GOTO 520
1390 O4=O P4=P B1=1 SOUND 75 2 GOTO520
1400 'SUB TO GIVE INSTRUCTIONS
      ****************************
1410 CLS0 PRINT@13  artist"  PRINT@73
     *instructions* , PRINT@12 B "   THE  ARTIST
     PROGRAM CAN BE USEDWITH OR WITHOUT JOYSTICKS
     YOU CAN USE THE  SHIFT  BUTTON  TO GIVE YOU
     LINES OF PERSPECTIVE  (MORE LATER )
1420 GOSUB 1550
1430 CLS2 PRINT" FIRST dragon WILL ASK YOU
     SOMEQUESTIONS TO SET  UP THE SCREEN  HAVING
     SET THE SCREEN YOU HAVE AFLASHING DOT MOVE
     THIS WITH THE ARROW KEYS OR THE JOYSTICK
1440 PRINT@224 " TO DRAW PRESS "C" FOR CONTROL
     dragon WILL BEEP WHILE HE AWAITSYOUR COMMAND
1450  PRINT *******************************
      PRINT   IF   YOU  NEED help AT ANY TIME
      PRESS 'C' THEN 'N'
1460 GOSUB 1550
1470  CLS3 PRINT@32 "  COMMANDS CAN BE -"
      PRINT@96 " I   NOW THE DOT LEAVES A LINE
      IN YOUR PEN COLOUR            O - REMOVES
      THE  PEN  FROM THE      PAPER      X - STOPS
      THE DRAWING READY        FOR TAPING
1480 PRINT E - TURNS YOUR DOT INTO A LARGE ERASER
1490 PRINT  0-8 - CHANGES PEN COLOUR AFTER
     REMOVING  PEN FROM PAPER
     (VALID COLOURS ONLY)
1500 GOSUB 1550
1510 CLS 4 PRINT@32  B - TAKES YOU INTO BOX MODE
     FIRST TIME ROUND dragon REMEMBERS WHERE YOU
      ARE  NEXT TIME  ROUND   HE   WAITS (BEEPING)
     FOR EITHER      B    HE DRAWS A BOX  L    HE
     DRAWS A LINE
1520 PRINT 'G'  HE GETS THE BOX
1530  PRINT PRINT   G  - dragon WILL PUT BACK THE
      PART OF THE DRAWING YOU  HAVE ALREADY  GOT'
      IN BOX  MODE
1540 GOSUB 1550 CLS7 GOTO 1580
1550 PRINT@481   PRESS ANY KEY FOR NEXT PAGE
1560 IF INKEY$=   THEN 1560 ELSE RETURN
1570 CLS7
1580 PRINT@ 64 " P - dragon WILL  WAIT  (BEEPING)
     FOR  THE  NUMBER  OF  A  VALID  AVAILABLE
     COLOUR  HE WILL      THEN PAINT UNTIL
     HE MEETS        THE PEN LINE COLOUR
1590 GOSUB 1550
1600 CLS5 PRINT@64 " R   dragon WILL WAIT
     (BEEPING)       FOR  A RING  SIZE  FROM 1-Z
      ( YES zed  '  )   HE WILL THEN DRAW A CIRCLE
       OF THAT SIZE
1610 GOSUB 1550
1620 CLS8 PRINT@10  *PERSPECTIVE* . PRINT@96
     THE  FIRST  TIME YOU PRESS THE    SHIFT
      BUTTON dragon DRAWS A   SMALL TARGET AND
     EVEN IF YOU RUBIT OUT HE WILL REMEMBER
     WHERE ITWAS  ANY TIME YOU PRESS THE
       SHIFT  BUTTON AGAIN HE WILL   DRAW A LINE
1630 PRINT FROM WHERE YOU ARE  TO THE CENTRE
      OF THE TARGET
1640 GOSUB 1550
1650 CLS7 PRINT@ 96,  TO SAVE A PICTURE PRESS -
     'C      X'  'S'  dragon  WILL  THEN SWITCH
    YOUR    RECORDER ON AND WAIT FOR A
     TITLE HE WILL THEN SAVE IT IN   MACHINE CODE
    FOR YOU TO USE     IN ANY SUITABLY ADAPTED
    PROGRAM
1660 PRINT@352   new get drawing'press  any  key
      IF INKEY$ =" THEN 1660
```

```
1670 RETURN
1680 'SUB TO GET & PUT*********
1690 IF G<>0 THEN 1730
1700 GET(O P)  (O4 P4) F G
1710 O5=ABS(O4-O) P5=ABS(P4 P)
1720 G=1 GOTO 1760
1730 O6=O+O5 IF O6>256 THEN O6=256
1740 P6=P+P5 IF P6>191 THEN P6=191
1750 PUT(O P)-(O6,P6),F PSET B=0
1760 RETURN
1761 '**************************************
1770 'SUB  TO  PRINT  PICTURE  TO  PRINTER
*****************************************
1780  'INSERT YOUR  PRINTER  ROUTINE   HERE
*****************************************
1790 RETURN
```

Battleships

***Mark Beckham** sets out to search and destroy*

THIS PROGRAM provides a computer simulation of the game Battleships. In this version you are pitted against the computer and must destroy its ships before it sinks your fleet.

The computer draws up a hi-res grid and plots the positions of both its ships and your vessels. The computer then sets up a random search pattern for its shots while you can pick any spot on the grid and fire. A successful shot is greeted with a picture of the ship being blown up to the accompaniment of suitable sound effects.

Full instructions on playing the game are included in the program. Good luck.

Program notes

10-90	Get started and draw grid
100-360	Dimension arrays, see if instructions are needed and set positions of ships
360-480	Get player's shot, check for hit
490-660	Random hazards, computer's shot
670-790	Sound of missile and hit
790-1090	Graphics
1100-1430	Random hazards, plot grid, instructions

```
10 REM CLEAR GRAPHICS PAGES NEEDED,CLEAR HI-RES SCREEN
20 PCLEAR8 PCLS
30 REM DRAW GRID
40 FOR YT=40 TO 190 STEP 16
50 LINE (40 YT)-(240 YT) PSET
60 NEXT YT
70 FOR VN=40 TO 200 STEP 16
80 LINE(VN 30)-(VN 190) PSET
90 NEXT VN
100 REM DIMENSION ARRAY FOR PRINTING & BLANKING OUT OF TORPEDO.CLEAR SCREEN
110 CLS
120 DIMTP(12,12)
130 DIM BL(12,12)
140 REM HELLO
150 REM GET STARTED SEE IF USER NEEDS INSTRUCTIONS
160 PRINT@228 "**COMPUTER BATTLESHIPS**" FOR K=1 TO 1000 NEXT K
170 PRINT"NEED INSTRUCTIONS?"
180 NO$=INKEY$ IF NO$=""THEN180
190 IF NO$="Y" THEN GOSUB 1390
200 REM SET UP SHIPS
210 A=RND(100) B=RND(100) C=RND(100) D=RND(100)
220 REM CHECK FOR REPEATEDNUMBERS
230 IF A=B OR A=C OR A=D OR B=C OR B=D OR C=D THEN 210
240 CLS PRINT"YOUR SHIPS  ARE AT "
250 PRINTA PRINTB PRINTC PRINTD
260 PRINT"HIT ANY KEY WHEN READY"
270 L$=INKEY$ IF L$="" THEN270
280 CLS
290 REM SET UP COMP SHIPS&CHECK FOR REPEAT OF NO
300 E=RND(100) F=RND(100) G=RND(100) H=RND(100
310 IFE=F ORE=G OR E=H OR F=G OR F=H   OR G=H THEN300
320 PRINT"THE COMPUTER HAS SELECTED THE   POSITION OF IT'S SHIPS."
330 PRINT"HIT ANY KEY WHEN READY"
340 X$=INKEY$ IF X$="" THEN340
350 CLS
360 REM GET POSITION OF SHOT& CHECK FOR HIT
370 INPUT"COMMANDER AT WHICH POSITION DO  YOU WISH TO FIRE SIR(1-100)",M M=FIX(M
) IF M=101 THEN GOSUB1350
380 IF M>100 OR M<1 THEN CLS GOTO370
390 REM BRANCH TO SOUND OF MISSILE SECTION
400 GOSUB690
410 REM BRANCH TO PRINTING OF GRID SECTION
420 GOSUB 1220
430 REM CHECK TO SEE IF A HIT HAS BEEN MADE.IF ONE HAS BEEN MADE THEN SET THE VA
RIABLE WHICH STORES THE SHIPS CO-ORDINATE TO ZERO SO THAT IT CAN NOT BE HIT TWIC
E AND ADD ONE TO THE HIT COUNTER THEN BRANCHTO THE HIT SECTION.
440 IFM=E THEN E=0 ZA=ZA+1 GOSUB730
450 IFM=F THEN F=0 ZA=ZA+1 GOSUB730
460 IF M=G THENG=0 ZA=ZA+1 GOSUB730
470 IF M=H THENH=0 ZA=ZA+1 GOSUB730
480 REM COMPUTERS SHOT&CHECK FOR HIT
490 CLS IFZA=4 THEN840
500 PQ=RND(100) IFPQ=10 THEN GOSUB1100 REM ONE OF THE RANDOM HAZARDS HAS OCCURED
510 IF ZR=4 THEN850
520 IF PO=19 THENGOSUB I160 PEM A RANDOM HAZARD HAS OCCURED
530 IF ZB=4 THEN 850
540 REM GIVE THE COMPUTER HIS SHOT
550 O=RND(100)
560 PRINT"THE COMPUTER HAS SELECTED POINT " O "AS IT'S TARGET" FOR NN=1 TO 300 N
EXT NN
570 REM BRANCH TO SOUND OF MISSILE SECTION
580 GOSUB690
590 REM CHECK TO SEE IF COMPUTER HAS SCORED A HIT,IF IT HASTHEN SET VARIABLE STO
RING POSITION OF SHIP TO ZERO,ADD ONE TO SCORE COUNTER AND BRANCH TO HIT SECTION
600 IF O=A THENA=0 ZB=ZB+1 GOSUB730
610 IF O=B THENB=0 ZB=ZB+1 GOSUB730
620 IFO=C THENC=0 ZB=ZB+1 GOSUB730
630 IFO=D THEND=0 ZB=ZB+1 GOSUB730
640 REM IF THE PLAYER HAS LOST THEN TELL HIM SO.
650 IFZB=4 THEN850
660  PEMARANCH TO INPUT OF PLAYERS SHOT SECTION
670 CLS GOTO370
680 REM SOUND OF MISSILE
690 FOR V=150 TOI20 STEP -1
700 SOUNDV,1
710 NEXTV
720 RETURN
730 GOSUB890
740 PEM SOUND OF HIT
750 PLAY"T100"
760 FOR Q=I TO 30
770 PLAY"O4V3IAG"
780 NEXTQ
790 CLS
800 REM A HIT HAS BEEN MADE
810 PRINT@238 "a hit" FOR SM=1 TO 600 NEXT SM FOR HA=I TO4 PLAY"T50,O2CDEFGABO3C
DEFGABO4CDEFGAB" NEXT HA
820 RETURN
830 REM SOMEBODY HAS WON
840 PRINT"YOU BEAT THE COMPUTER!!" GOTO860
850 PRINT"PLAYER1,ALL YOUR SHIPS ARE LOST!HA HA THE COMPUTER IS THE WINNER" GOTO
870
860 PLAY"O3T1GT4GA-A-P4TIL8GT2A-GFE-L2DP6L3A+G+L17GFG+FA+P8L4G+GFE-"
870 INPUT"ANOTHER GO" II$ IFII$<>"Y" THENPRINT"CHICKEN" END ELSE RUN
880 REM DRAW BOAT WHICH IS TO BE HIT BY MISSILE
890 PMODE4 SCREENI,1 PCLS
900 DRAW"BM60 80 F8 R70 E8U5L80R10UIL5U3R15D3L5D1L9U3L6R6D2R9UIL9U1R9UIL9RI2D4BM
96 80 UI4D4L2R2U4R6UI0R6L2U4L2R2D4R2DI0R6D4L20"
910 DRAW"BR20U4R8D4L8R8D2R6D6RI8DIUIL8UI6L4G2DR6L6DI3"
920 DRAW"BMI22,76,R2D4L2U4,BM98,78,U6R2D6L2,BM68,80F3R78"
930 REM FILL PARTS OF BOAT WITH COLOUR
940 PAINT(110,78),1,1
950 PAINT(1 1,7 ),1,1
960 DRAW"BM10 [illegible] 3G7F2F7U D2G7H "
970 REM GET TORPEDO AND BLANK AREA IN ARRAY
980 GET(1 1)-(13 13) BL,G
990 GET(1 120)- 14,14 ) TP G
1000 REM MOVING HI-RES GRAPHICS
1010 FOR A=1 TO92 STEP 
1020 REM PUT TORPEDO ON SCREEN THEN BLANK IT OUT REPEAT THIS TO CREATE MOVEMENT.
1030 PUT(A 151-A)- A+12 193-H  TP PSET
1040 PUT A 181-A)-(A+12 195-H) BL PSET
1050 NEXT A
1060 PUT 92 89)-(104 101) TP,PSET
1070 REM DRAW CIRCLES OF INCREASING RADII AND RANDOM COLOUR TO CREATE AN 'EXPLOSI
ON'
1080  FOR Q=1 TO10  ZC=RND(3  1 CIRCLE(105 83  Q ZC FOR JJ=1 TO 10 NEXT JJ NEXT
Q
1090 RETURN
1100 REM ONE OF SHIPS LOST
1110 PRINT"ONE OF YOUR SHIPS HAS BEEN LOST IN THE FOG" ZB=ZB+1
1120 FORCM=1 TO 2000 NEXT CM CLS
1130 REM SHIP MAY BE FOUND DEPENDING ON RANDOM NUMBERS
1140 CX=RND(5) DE=RND(5) IF DE=3 AND CX=2 THEN 1150 ELSE RETURN
```

The Second 6809 COLOUR SHOW

FOR DRAGON AND TANDY USERS

SATURDAY 30TH AND SUNDAY 31ST MARCH
THE ROYAL HORTICULTURAL HALLS
10 A.M. UNTIL 6 P.M.

Everyone said the first show was good!
"Over 7,000 people attended ... queues formed early ... "Dragon User, Jan 85.
"The show was a tremendous success" Dragon Users Group.
"Many thanks for the very worthwhile 6809 show" Grosvenor Software.

This show will be even better!!
Even more to see and choose from. The very latest **hardware, software, interfaces** and **peripherals** will be there together with all your old favourites. Your chance to get up to date, try and buy all thats new. And pick up some **amazing bargains**.

Over 60 companies and organisations will be exhibiting with **special offers** on their products.

We'll also be organising events and competitions with **lots of prizes**. The manufacturers will be staffing **advice centres** to help with all your queries.

Large gangways and spacious rest areas will make sure you can see everything and sit in comfort when you want. The second 6809 Colour Show is a **family** show, a good day out.

HOW TO GET THERE

The Royal Horticultural Halls are just off Victoria Street a few minutes walk from Victoria or Parliament Square.

Buses 11, 24, 29, 70, 76 and 88 run up Victoria Street.

Underground stations; St. James Park (District and Circle lines), Victoria (District, Circle and Victoria lines).

There is an NCP car park in Abingdon Street, a few minutes away.

This exhibition is organised by:
Computer Marketplace (Exhibitions) Ltd.,
Part of the Rushworth Dales Group,
20 Orange Street,
LONDON WC2H 7ED

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To Computer Marketplace (Exhibitions) Ltd 20 Orange Street London WC2H 7ED

Please rush me 'fast lane' tickets for the Second 6809 Colour Show
☐ (Qty) Adult tickets at £2.00 ☐ (Qty) Under 12 year old tickets at £1.00

I enclose cheque/P.O. to the value of £________ or debit my Access/Diner/American Express card
No ________________ Signature ________________
Name ________________
Address ________________
Postcode ________________ Telephone ________________

6809 is the registered name of Motorola Ltd

```
1150 PRINT"YOU WERE LUCKY, IT HAS BEEN FOUND" [illegible] 1 FOR CB=1 TO 2000 NEXT [illegible]
     RETURN
1160 REM ANOTHER HAZARD
1170 PRINT"THE CREW OF ONE OF YOUR SHIPS LOST THEIR NERVE"
1180 PRINT"THEY ABANDONED SHIP" ZB=ZB+1
1190 FOR HS=1 TO 2000 NEXT HS
1200 CLS
1210 RETURN
1220 REM SET GRAPHICS MODE AND COLOUR SET
1230 PMODE3,5 SCREEN1,0
1240 REM SECTION TO PAINT HI-RES GRID
1250 A5=0
1260 A6=0 A7=0
1270 FOR A6=28 TO 1[illegible] STEP 16
1280 FOR A7=48 TO 1[illegible] STEP 16
1290 A5=A5+1
1300 IF A5=M THEN PAINT(A7,A6),4,4 GOTO 1320
1310 NEXT A7,A6
1320 FOR EW=1 TO 1000 NEXT EW
1330 RETURN
1340 REM USER HAS REQUESTED TO SEE HI-RES GRID-SHOW HIM IT
1350 PMODE3,5 SCREEN1,0
1360 IF INKEY$="" THEN 1360
1370 RETURN
1380 REM INSTRUCTIONS
1390 CLS PRINT"IN THIS GAME YOU OUR BRAVE SEA  CAPTAIN MUST DEFEAT YOUR ENEMY (
THE FIERY DRAGON(32K VARIETY)) THIS WILL NOT BE EASY.UNKNOWN   HAZARDS AWAIT YOU
.TO SHOOT YOU PICK A NUMBER(1-100) THIS POINT YOU WILL SEE ON A HIGH-RES GRID"
1400 FOR NC=1 TO 7000 NEXT NC
1410 CLS PRINT"YOU CAN SEE THE THE GRID BY      TYPING 101 IN REPLY TO THE
'COMMANDER,WHERE DO YOU WISH TO  FIRE SIR  PROMPT.HITTING ANY    KEY WILL RETURN
YOU TO TEXT     GOOD LUCK RYFF"
1420 FOR NB=1 TO 6000 NEXT NB
1430 RETURN
```

Dragon bulletins

WITH THE demise of Dragon Data many Dragon computer owners feel very let down with many software companies abandoning the Dragon for more lucrative markets

However now you have a chance once again to put your humble Dragon to work and open up new horizons On February 17 a new bulletin board went on line This bulletin board is operating in conjunction with REACT United Kingdom s (a volunteer communications organisation) bulletin board As well as providing information about REACT UK and what local teams are doing in the community there is also a section for Dragon computer owners

If you are the owner of a Dragon 64 all that you will require is a telephone modem with a 300/300 baud operating rate and some software to drive it Owners of the Dragon 32 will also require an RS 232 interface However this need not cost you a fortune

I have been trying out the communications packages supplied by Cotswold Computers of 6 Middle Row Chipping Norton Oxon who can supply a complete communication package for the Dragon 32 for £169 Disk drive users can still use their drives as the RS 232 interface and DOS cartridge will work in tandem if you use a mother board Dragon 64 owners having an RS 232 interface built into their machines only require a modem and software which will cost about £115

If this sounds like a lot of money to spend to access one Dragon bulletin board bear in mind that once you have purchased your comms unit you will be able to enter the fascinating world of Micro Communications If you have never experienced the joy of your home computer talking to and being answered by giant mainframes I can assure you that it opens up a new world of exciting possibilities

RBBS the new bulletin board caters for Dragon computer owners who have sadly been neglected by most of the other bulletin boards There will be facilities to leave messages for other Dragon users to swap ideas and problems on the Noticeboard section and even sell your unwanted bits and pieces If the demand is there it will also have facilities to upload and download free software But the most important thing about RBBS is it is for Dragon users to communicate with other Dragon users to help and further the use and understanding of the Dragon computer — and its FREE

RBBS will be on line 24 hours a day except for Saturday mornings between 9 am and 12 noon when the system will be updated The system runs on a Dragon 64 with specially written software and several disk drives

To access RBBS first connect your modem and run the software — make sure the modem is set for 300/300 baud Dial up RBBS on 0376 518818 After one or two rings the auto answer modem will transmit a tone then switch your modem on line and replace the telephone receiver You should then receive the opening page which will tell you that you are connected to RBBS

You will be asked to enter your name and password Please enter your correct name as this will be used at a later date to let you know if there are any messages for you As you will be a first time user enter U to the prompt PASSWORD You will then be asked if your computer will accept lower case letters answer Y if yes if not answer N You will then be presented with a menu of options that you may access You will not be able to use the Noticeboard until you register as a user — this is to prevent abuse of this section Registration is FREE and facilities are available on the bulletin board for you to register

We want you to have fun using the bulletin board but please remember that the bulletin board is only as good as the people who use it so your contributions and comments are very important ■

Brian Lloyd

Forth Protocol

Mark Varney *explains how Forth is used as a language*

FORTH IS probably one of those least understood but most versatile and useful programming languages available today. Versions of FORTH seem to be available for almost every type of machine today — even including the new 32-bit processors. While end-users of the language (including both programmers and hardware design engineers alike) seem to endlessly extol its virtues, FORTH does not seem to have developed the following or popularity it deserves. This is unfortunate, especially to people like myself who seem to have been mistakenly labelled with the title of "software gurus" because we dabble in a language which is neither primitive (machine code) nor high-level (eg Basic), and use computer jargon that is not in common use.

FORTH is admittedly not an easy language to understand at first glance. The immediate impression a newcomer to FORTH would get is that the language consists only of "words" — there are no line numbers — and that numbers have to be entered in before the operators. A program would therefore consist of several words all on one line or on several separated by blanks and contained either in a "dictionary" or within "screen files" (both convenient areas of RAM which can be saved in the same way as a Basic program listing). The difference between them is that the dictionary will hold words which can be used immediately by typing them in at the keyboard. Screen-files on the other hand contain words which have to be loaded into the dictionary before they can be used.

An extremely useful feature of FORTH is that "words" which carry out different routines designed by the programmer can be called anything you wish. This flexibility can be a valuable asset in aiding the "documentation" of a program — for example the following sequence of four FORTH words

GET DATA VALUE
TAKE SQUARE
MULTIPLY BY PI
PRINT VALUE

needs no explanation as to what happens to the DATA VALUE. The use of English (in this case) means that programs can employ an application specific vocabulary of words that will clearly be understood by the user.

Another useful feature is that this sequence of words can all be defined within yet another FORTH word so that only one word, eg AREA, need be typed in instead of all four in order to "execute" the routine. The sequence of defining words within words can go on *ad infinitum* and it is this procedure that gives writing programs in FORTH the name "bottom-up" or "structured programming".

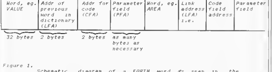
The process of building up routines and defining words in this way, and then entering them into the dictionary is known as "compilation". All high level languages have a dictionary of sorts — you'll find one if you PEEK around the Basic ROM (from &HA049 onwards) inside the Dragon, for example.

FORTH's dictionary begins in low memory, and expands up sequentially towards high memory, so for example AREA would be the last entry if no other words were defined afterwards. When it comes to "executing" the word AREA, FORTH will load an "instruction pointer" with the address of the last word in the dictionary and if it corresponds to the word typed in will start to run that routine. If the two words do not correspond then the last word in the dictionary will itself contain another pointer to the previous word before it in the dictionary (actually called a "link address"). If this does not fit then the next word is "linked" and tested, and so on until (in the case of a typing mistake) the whole dictionary would be searched from top to bottom.

Elementary routine

If the word definition is a very elementary routine — like adding two numbers together, or the LOOP instruction (similar to Basic's FOR...NEXT) — then the procedure used to carry it out is written immediately after the dictionary entry, and in machine code. The elementary words are termed "primitives" since you cannot do much else without them. Because the "primitives" are so useful they cannot usually be erased from the dictionary as can other words.

It is for these reasons that some people



High memory -->

Word, eg. VALUE	Addr of previous word in dictionary (LFA)	Addr for code (CFA)	Parameter field (PFA)	Word, eg. AREA	Link address (LFA) i.e.	Code field address	Parameter field
32 bytes	2 bytes	2 bytes	as many bytes as necessary				

Figure 1.
Schematic diagram of a FORTH word as seen in the dictionary. The words are divided into four fields holding either code or an address pointer. The code field address contains a pointer to executable machine code or to the parameter field. The address pointer for the vocabulary is held within the parameter field.

use FORTH alone — because of the linking nature between words the language is fast (much faster than Basic) and for certain cases can be as fast as machine code if properly tuned. That indeed should be sufficient incentive for anyone to learn FORTH who requires speed but does not wish to learn machine code assembler!

Words which access other pre defined words or do not act on numbers alone will have a similar structure but will branch off to other addresses in the dictionary and jump back again using these routines exactly as subroutines. Actually when it comes to examine FORTH words in more detail (which is not usually necessary) they contain more address codes which link the word to various other parts of memory (figure 1). But it is this structure that forces FORTH to have a very low memory requirement comparable to and in many instances less than the equivalent assembler routines! For example if a particular application were being developed (word processor editor debugger etc) then the final program might be compressed into an area as little as 2Kbytes!

This makes FORTH an ideal language to have on small microcomputers where memory size is naturally at a premium. Where one might consider eg the writing of a routine for an EPROM blower or communications network too complex it is actually an easy matter in FORTH (once you know what to do). Even complex subjects such as artificial intelligence programming or digital signal processing are easily implemented on the FORTH system.

FORTH is used extensively in my work in electrochemistry for the generation of signals applied to electrodes and the collection of data. Under most circumstances FORTH is fast enough to deliver and capture signals at rates up to several hundreds and even thousands of Hertz. On the odd occasion when higher data sampling rates have been required FORTH again has the facility to enable machine code to be used in place of FORTH words.

Assembler written in

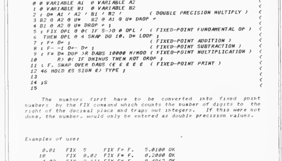
So instead of having to load up a separate assembler/editor to 'code' a particular routine and then have to deal with complicated USR calls from within Basic an assembler is written into the FORTH dictionary and the resultant machine code is used just as another word would be. This is a perfectly natural process because FORTH is itself a series of machine coded routines that are 'threaded' together through the use of link and calling addresses. My own philosophy has been to write everything in FORTH and then if a particular portion of a program needs speeding up (eg the graphics) then those rate limiting steps would be re-coded in machine code. This is in fact probably the easiest way to learn machine code/assembly language because FORTH is so close to it itself.

However the major disadvantage is that FORTH relies heavily on the programmer to detect and correct mistakes. FORTH does not have all the extensive error checking facilities of Basic so it does not automatically monitor (for instance) the 'zero' condition when one number is divided by another or the 'over-range' condition on multiplication.

Indeed the representation of numbers in general terms is poor. The 6809 Dragon versions of FORTH do not come with floating-point arithmetic. Mathematical routines have to be done in integer arithmetic — the variety of words for handling integers is actually much better than Basic. However it is not difficult to write your own fixed- or floating point software routines (figure 2) and this is where I think much of the misunderstanding comes in.

FORTH has never had a 'standard' in the same way as Basic has and I probably never will because different people use it for different applications. Not everyone wants an extended arithmetic capability and for them it would only take up valuable memory that could be used for other purposes. The flexibility of FORTH has meant that there are no programming barriers — the ultimate performance is only limited by the ingenuity of the programmer. Sine cosine logarithms etc are quite easy to code yourself (figure 3) once you have been shown how to do it.

The concept of the 'stack' and handling of numbers is perhaps the hardest feature



```
Figure 2
            FORTH  definitions  for  some elementary  fixed  aritheetic
expressions

SCR £ 1
  0 0 VARIABLE A1  0 VARIABLE A2                                     <
  1 0 VARIABLE B1  0 VARIABLE B2                                     <
  2 : D* A1 ! A2 ! B1 ! B2 !          ( DOUBLE PRECISION MULTIPLY )  <
  3 B2 @ A2 @ U*   B2 @ A1 @ U* DROP +                               <
  4 B1 @ A2 @ U* DROP + ;                                            <
  5 : FIX DPL @ 0< IF S->D 0 DPL !  ( FIXED-POINT FUNDAMENTAL OP )   <
  6  THEN DPL @ 4 SWAP DO 10. D* LOOP ;                              <
  7 : F+ D+ ;                         ( FIXED-POINT ADDITION )       <
  8 : F- -1 D+- D+ ;                  ( FIXED-POINT SUBTRACTION )    <
  9 : F* D* DUP >R DABS 10000 M/MOD ( FIXED-POINT MULTIPLICATION )   <
 10       R> 0< IF DMINUS THEN ROT DROP ;                            <
 11 : F. SWAP OVER DABS <£ £ £ £ £  ( FIXED-POINT PRINT )            <
 12 46 HOLD £S SIGN £> TYPE ;                                        <
 13                                                                  <
 14 ;S                                                               <
 15

      The  numbers  first  have  to  be  converted  into  fixed  point
numbers  by the FIX command which counts the number of digits to  the
right of the decimal place and traps out integers.   If this were not
done, the numbers would only be entered as double precision values.



Examples of use:

    0.01   FIX  5      FIX F+ F.   5.0100 OK
   10      FIX  0.02   FIX F* F.   0.2000 OK
   -4.02   FIX -2.111  FIX F* F.   8.4862 OK
    3.1415 FIX  2.25   FIX F- F.   0.8915 OK
```

▶

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```
[illegible] 10000

SCR £ 2
  0 : TABLE <BUILDS 0 DO , LOOP DOES>                          <
  1          SWAP 2 * + @ ;            ( STACK TO DICTIONARY ENTRY )  <
  2 10000 9998 9994 9986 9976 9962 9945 9925 9903 9877          <
  3  9848 9816 9781 9744 9703 9659 9613 9563 9511 9455          <
  4  9397 9336 9272 9205 9135 9063 8988 8910 8829 8746          <
  5  8660 8572 8480 8387 8290 8192 8090 7986 7880 7771          <
  6  7660 7547 7431 7314 7193 7071 6947 6820 6691 6561          <
  7  6428 6293 6157 6018 5878 5736 5592 5446 5299 5150          <
  8  5000 4848 4695 4540 4384 4226 4067 3907 3746 3548          <
  9  3420 3256 3090 2924 2756 2588 2419 2250 2079 1908          <
 10  1736 1564 1391 1219 1045 0872 0698 0523 0349 0175          <
 11  0000                              ( 91 VALUES PLACED ON STACK )  <
 12 91 TABLE SINTABLE                  ( AND THEN PUT IN DICTIONARY )  <
 13 : S180 DUP 90 >                    ( TESTS IF GREATER THAN 90 DEG )<
 14 IF 180 SWAP - ENDIF                ( YES? SUBTRACT 180 DEGREES )  <
 15 SINTABLE ;                         ( AND THEN TAKE SINE )   -->   <

SCR £ 3
  0 : SINE 360 MOD                                              <
  1 DUP 0< IF 360 + ENDIF              ( BRING RANGE WITHIN +/- 360 )  <
  2 DUP 180 >                          ( ?GREATER THAN 180 DEGREES )  <
  3 IF 180 - S180 MINUS                ( YES? SUBTRACT 180, NEGATE SIN)<
  4 ELSE S180 ENDIF ;                  ( NO? TAKE STRAIGHT SINE ANGLE )<
  5                                                             <
  6 : COS 360 MOD                      ( PREVENT OVERFLO NEAR 32767 )  <
  7 90 + SINE ;                        ( COS=SINE + 90 DEG PHASE SHIFT)<
  8 ;S                                                          <
  9                                                             <
 10                                                             <
 11                                                             <
 12                                                             <
 13                                                             <
 14                                                             <
 15                                                             <

Examples of use:
                    90 SINE .     10000 OK
                    45 SINE .     7071 OK
                   265 SINE .     -9962 OK
                   290 COS  .     3420 OK
```

of FORTH to understand. There are two stacks a parameter stack and a return stack — the return stack is not encountered often except for very specialised operations. Anyone who has had either a Sinclair or Hewlett Packard calculator will be familiar with stacks and reverse Polish logic as it's called!

Temporary store

Any stack is simply a contiguous area of memory where data may be temporarily stored. Each stack location may hold a single value and the position of the last value added to the stack is held in a stack pointer (as an address). Putting data on to the stack is much like piling cafeteria trays up — the last entered value is the most visible. Those below cannot be accessed until the top value is removed but you can see how big the pile is. So to add two numbers together for example both numbers should be entered on to the stack then the mathematical operation for addition performed (the stack pointer is automatically adjusted at each step).

Getting used to the stack and manipulating numbers once they are on it is a matter of experience but again stack operations at first sight can seem a little peculiar. For example the equivalent of FOR NEXT in FORTH is DO LOOP but where Basic would specify the beginning and end limits of the counter as I = 1 TO N the two limits have to be placed on the stack first and in reverse order so that the 1 comes off first ie N 1 DO LOOP. But the stack operations are a very powerful feature of FORTH it's possible to SWAP the top two numbers on the stack, ROTate them, copy one value OVER another, DUPlicate or DROP the top value and so on. An example of using the stack to advantage is instead of writing a separate subroutine that uses specific locations in memory to hold initial intermediate and final calculations e 16 by 16 or even 32 by 32 bit multiplication can be carried out on the stack — this will almost certainly run faster than the equivalent machine code version.

No language is perfect for all programming tasks. For example Basic is an easy language to learn and acceptably good at string handling but it is extremely slow and is limited in extended arithmetic operations. Attempting to write a fast 32-bit integration routine or an interactive database management system would push the language far beyond its intended scope.

Greatest strength

As a language FORTH is not exactly the bees knees, otherwise it would be far more popular than it already is — but it promotes the development of efficient logical straightforward and compact programs (even by inexperienced programmers). FORTH programs are usually portable across different machines even having completely different operating systems. The greatest strength lies in the building-block approach to programming permitting segments of code to be immediately tested and debugged on their own. FORTH contains both system and program development aids including a compiler screen or text editor input/output drivers and memory management — all of which are directly under the control of the user ■

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Dragonsoft

New software for review should be sent to *Dragon User* 12-13 Little Newport Street London WC2H 7PP

Masterstroke 2

Program *Masterstroke 2* PiKaDee Software 35 Parker Street Preston Lancs **Price** £6 95

THE NUMBER of utility packages appearing for the Dragon emphasise just how much of a programmers machine it is All the potential it has to accept new modifications to the original software I only wonder why Dragon Data did not incorporate many of these ideas into their original BASIC Interpreter

Masterstroke 2 is a useful addition to any Basic programmer s supply of commands A number of the rather obvious omissions from the Dragon Interpreter such as a MERGE command to merge BASIC program files Autorepeat of keys Inversion of the screen display (green on black or orange on black are available) and full error messages are included along with a host of other useful commands

Also made available from BASIC are the Semigraphics mode described in Keith and Steven Brain s book *Advanced Sound and Graphics for the Dragon* In this case they are called by GMODE A number of special graphics commands are supported GLINE GDRAW and GSET are rather similar to the ordinary PMODE commands with similar names It is also possible to have text mixed with the graphics

Special commands are available for scrolling the screen contents in all four directions Scrolling can be restricted to a part of the screen as well In addition we also have a facility whereby the 10 number keys can be programmed as function keys when used with the right arrow pressed These keys have already been given default values but it is also possible to redefine any of them for your own particular needs

Program listing speed can also be changed which normally needs a POKE to set unless you have *Masterstroke* installed Another useful utility is a command to convert a Tandy Co Co Basic program into Dragon Basic Various other commands give more options on the appearance of the display as well as the ability to strip off all the REMs in a program automatically

Just in case the advantages of the Semigraphics modes are not apparent to the user they have supplied a program written to demonstrate this facility in use This is another version of that old favourite of ancient Apple users the little Brick Out game and it serves its purpose well

All in all we have here a very useful utility package produced at a very reasonable price of £6 95 with a well-written set of instructions Once you have mastered the usual Basic fairly well then you could well find this to be a worthwhile purchase With the facilities it offers at the price it cannot but be very good value

Iolo ap Gwynn

★★★★★

Money, money, money!

Program *Moneybox* Harris Micro Software 49 Alexandra Road Hounslow Middlesex TW3 4HP
Price £14 99 (Disk)

ON RUNNING this program the display is converted into a 42 by 24 character on the graphics screen by a Machine Code routine which is held on the disk and called upon running the main program The display created is very good and even includes the £ sign

Also incorporated is an auto-repeat for the keyboard If anything this is the most annoying part of the program because they have made the delay before a repeat is registered much too short I have not been able to time the delay but it seems to be less than a second

With Moneybox it is possible to set each of the files (up to 99 separate ones) for a totally different purpose and account structure Each file is divided into 12 periods and the day upon which each period starts can be defined by the user Within each file there can be up to 80 accounts Fifty of these are already defined but can be changed very easily whilst 30 are left blank for any extra headings which may be required The first 20 are identified as Sources of funds The next 20 are sources of income

Finally account numbers 41 to 80 are for expenditure

Moneybox can then manipulate the data on these files to keep your bookkeeping up to date including VAT calculations if required All receipts payments etc are easily recorded and from these you can print out reports on to the screen or a printer prepare budgets and make forecasts of just how much of an overdraft you will have in a years time!

It is designed to be used also by a small business as a simple cashbook accounting system A comprehensive book of instructions comes with the disk and needs to be read carefully before attempting to use the program If anything the only criticism I have of the program itself is that it takes quite an effort to learn how to use it

Personally I prefer the spreadsheet approach to this type of task In that it is easier to follow especially in asking what if types of questions etc Having said that this still is quite a good package and would be very useful for anyone wishing to do such work

Iolo ap Gwynn

★★★★

Downland

Program *Downland* Microdeal 41 Truro Road St Austell Cornwall **Price** £7 95

AS WE have come to expect from Microdeal here is another quality arcade type game written in machine code The general idea this time is that the little character which appears on the screen has to be controlled by means of a joystick and its button through a series of caverns

On the way he has to jump to grab various items or Treasures as well as collect a key to pass through doors In pieces he also has to climb ropes in order to negotiate some of the more difficult parts of the caverns Controlling the jumping from the ropes is not easy even without the various horrible cavern-living creatures such as poisonous ants and birds which seem to appear at random and frequent intervals

At first it is not that obvious how to control the little man Specific points have to be reached on the ropes before jumping for a ledge The jump itself must be made with the joystick in the correct position All of this has to be learnt as you are playing the game At first your three lives do not seem to last very long but as you learn how to play the game and learn the necessary skills and you think you are getting on top it brings out a few new surprises just to make life interesting

The sounds are quite good and the highest resolution graphics are used which means that you have a choice between black green or buff backgrounds Having said that the quality of the graphics are good and the little walking jumping and climbing men is quite realistic I particularly liked the bit where he is trying to climb through a closed door!

If you are into challenging games like this then this is a must!

Iolo ap Gwynn

★★★★★

DRAGON 32
Downland
MICRODEAL

The Dragon Roars

***Pam D'Arcy** shows how to make your Dragon talk back to you*

A PROBLEM with using sound in BASIC on the Dragon is that it can be too pure and slow for many modern day sounds to be produced. What amazes me is that producing sound in machine code is unbelievably easy. As with graphics the difficulty lies within ourselves — either you are good in ideas and design or, like me, you struggle!

Rather than getting bogged down in a lot of detail first, as it is quite a short exercise, try the sample SOUNDBOX and I am sure that you will want to read on and begin constructing your own particular box of sounds to use in conjunction with your BASIC or machine code graphics programs.

Soundbox

Listing 1 — SOUNDBOX HEX DUMP Following complimentary remarks from users of the HEX LOAD method accompanying my Disassembler article, I have retained that formula.

Listing 2 — HEX LOADER (Basic) This is the Disassembler Hex Loader Program with changes to just three lines (numbers 3 42 47 for those who have retained their copies). For readers who did not see or use it, please turn to Figure A for instructions.

Listing 3 — SOUND SELECTOR (Basic) A self explanatory sound menu program allowing you to call up and repeat sounds at the touch of a key (you couldn't type EXEC in fast enough for proper appreciation of some of the SOUNDBOX effects).

Using HEX LOADER enter the SOUNDBOX machine code (Listing 1). Save the code (CSAVEM SOUNDBOX 28001 28300 28001). Enter and save the SOUND SELECTOR program. RUN the SOUND SELECTOR.

The machine code program that you have been using is position independent so will work if placed elsewhere in memory. It is structured so that, using an Assembler, simple amendment to the SOUND ROUTINE TABLE will enable you to add or delete specific sound routines building up a composite library of sounds that can be instantly called from BASIC programs by a simple POKE and EXEC. With machine code being so economical in memory, why not put all your sounds into one box, so to speak? Individual sound routines may be changed at any time and the re-assembly will automatically generate the correct current SOUND ROUTINE TABLE values for you.

The CONTROL ROUTINE switches on the sound source, executes the required sound routine according to the parameter passed across (POKEd) by BASIC, switches off the sound source and returns to the BASIC program. I used DREAM with PCLEAR1 CLEAR200 10000. Source code (object code $6D61-$6D83).

If you commence machine code routines with a Long BRAnch to the program entry point proper, as with this routine, the area immediately following the LBRA instruction may be used for passing information between BASIC and machine code (who says not to use EXEC because you can't pass parameters? I find this method far easier than USR). With this technique, no matter how many changes you subsequently make to the machine code routine you are unlikely to need to go back to the BASIC programs to amend the EXEC or POKE addresses. The method used to branch to the specific sound routines has many advantages:

a) it generates position independent code (PIC) enabling SOUNDBOX to work regardless of eventual load position.

b) there is no upper or lower limit on the number of SOUND ROUTINES supported by the program.

c) maintenance is easy as should amendments cause actual start addresses of the individual routines to change, an Assembly automatically generates an up to date table of values.

Use of the PIA has probably been the most consistently contentious issue in *Dragon User*. Should anyone dispute what I have to say about it or sound, or my explanations, my only defence is that I am neither a scientist nor musician and this is how I understand things to work in my layman's terms — and work they do.

There are two means of producing sound from within the Dragon other than through the external sources of cassette and cartridge ports. One way is known as the single bit sound signal (that I have not yet found exciting) and the other, discussed here, is the very flexible and easy to use DAC (Digital to Analogue Converter).

Sound is produced by switching on the equipment that controls the DAC, the MULTIPLEXER CONTROL LINES, and outputting a series of values 0-63 to the DAC itself. The actual sound made then depends on:

VOLUME *or* *AMPLITUDE* *or* *LOUDNESS* *or* *STRENGTH*	*of the sound made*	*The greater the difference between any two consecutive values output to the DAC the louder the noise is to the ear. The maximum difference is 63 (range 0 to 63)*
PITCH *or* *FREQUENCY* *or* *DURATION* *or* *RATE OF CHANGE*	*of the sound made*	*The longer the duration or delay between changing the values output to the DAC the lower in PITCH the noise sounds. There are no limits to the intervals between outputting consecutive values to the DAC but there are limits to what the ear can detect*

```
**************************************
** SOUNDBOX (C) P.D ARCY 1984 **
**************************************

        LBRA  START

* sound sel. param. from BASIC *
BPARAM ECB    0

* equates
EDAC   EQU    $FE20 ,addr of DAC
EENAB  EQU    $FF23 ,   SND ENAB.
EENON  EQU    $08   ,sound on
EENOF  EQU    $E7   .      off
ESSEL  EQU    $BD41 ;sound select
ESDAC  EQU    $00   ;select DAC
EROAR  EQU    $8000 ,start  ROAR
EROARE EQU    $C000 ,end of ROAR

**************************************
******* CONTROL ROUTINE *******
**************************************
START  PSHS   D,X,Y,U
       BSR    SNDON
       LEAX   SNDTAB,PCR
       LDA    BPARAM,PCR
       ASLA
       LDD    A,X
       JSR    D,X
       BSR    SNDOFF
       PULS   D,X,Y,U,PC

****** SOUND ROUTINE TABLE *****
*                           BPARAM
SNDTAB FDB    LASER-SNDTAB  ;0
       FDB    PHASER SNDTAB ;1
       FDB    ROAR SNDTAB   ;2
       FDB    EXPLOD SNDTAB ;3
       FDB    GUN SNDTAB    ;4
       FDB    FREQ SNDTAB   ;5
```

I am told that the ear contains a number of receptor cells, each one of which responds to a specific frequency. It is able to recognise a number of different frequencies of sound simultaneously. All sound is made up of amplitude and frequencies. Most noises are not a single sound but a simultaneous mix of sounds at different frequencies.

The Dragon is able to output sounds at frequencies far higher than the human ear can detect, so often output needs to be slowed down to make it audible to humans. If you can analyse the sound that is needed then it can probably be recreated on the Dragon. Analysis of sound for translation to computer terms should make a very interesting article — any takers? My efforts are produced by trial and error.

Listing 1
SOUNDBOX HEX DUMP

```
28001 16 00 01 00 34 76 BD 10 30 8C  549
28011 BC A6 8C F5 48 EC 86 AD 00 8D 1458
28021 1F 35 F6 00 53 00 63 00 7E 00  630
28031 8D 00 AA 00 D2 34 46 C6 00 8D 1030
28041 BD 41 F6 FF 23 CA 00 F7 FF 23 1537
28051 35 C6 34 02 86 FF 23 84 F7 07 1339
28061 FF 23 35 02 34 02 48 48 34 02  725
28071 B6 FF 20 84 03 AA E4 B7 FF 20 1472
28081 32 61 35 02 34 04 5A 26 FD 35  820
28091 04 BD E3 00 F5 39 00 34 02 A4 1161
28101 8C FA BD F3 35 02 C6 01 86 3F 1353
28111 BD E0 4F 8D E0 5C C1 C8 26 F4 1595
28121 39 00 10 8E 00 05 86 3F A7 8C  724
28131 F6 0D 0B 4A 26 FB 6A 8C EE A6 1587
28141 8C E0 26 F3 31 3F 26 EA 39 8E 1239
28151 00 00 C6 14 A6 80 BD 8D 8C C8 1302
28161 00 26 F7 39 86 3F A7 8C 07 8E 1171
28171 80 00 C6 14 A6 80 BD AF 1F 10 1003
28181 C4 FF 26 03 6A 8C A5 8C C8 00 1235
28191 25 EC 39 8E 00 00 86 3F A7 8C 1104
28201 97 C6 14 86 3F 8D 8C 4F 8D 69 1204
28211 C6 14 A6 80 8D 89 1F 10 C4 03 1036
28221 26 F4 6A 80 FF 7E 26 EE 39 00 1243
28231 00 00 00 10 8E 01 90 B6 FF A7  859
28241 8C F3 B6 01 A7 8C EF A7 8C ED 1608
28251 A7 8C E0 6A 8C E6 26 8C BD 24 1245
28261 86 78 A7 8C DD 31 3F 26 01 39  990
28271 6A 8C 06 26 07 BD 17 B6 3C A7 1030
28281 8C CD 6A 8C C8 26 0E 8D 0F 86 1344
28291 1E A7 8C C2 20 05 86 3F 20 BA 1015
28301 B6 DA 2B B6 6A 8C B2 A6 8C AF 1097
28311 17 FF 07 4F 17 FF 03 39 00 00  782


 OVEAALL CHECKSUM TOTAL 36405
```

The MULTIPLEXER CONTROL LINES are governed by the Dragon locations $FF01 $FF03 and $FF23 The appropriate $FF01 and $FF03 settings can be carried out for us by using a BASIC ROM routine at address $BD41 It requires the sound source to be set up in Register B the sound sources being

$00 DAC
$01 Cassette
$02 Cartridge port

Bit 3 ($08) of location $FF23 the SOUND ENABLE BYTE then needs to be set=1 When we have finished using sound this bit needs to be unset that is made zero but no equivalent to selecting the sound is needed Sound source Turn DAC sound source on (object code $6D84-$6D94) and turn DAC sound source off (object code $6D95–$6DA0)

```
********************************
********* SUBROUTINES **********
********************************

*** turn DAC sound source on ***
SNDON   PSHS    D,U
        LDB     #ESDAC
        JSR     ESSEL
        LDB     EENAB
        ORB     #EENON
        STB     EENAB
        PULS    D,U,PC

*** turn DAC sound source off **
SNDOFF  PSHS    A
        LDA     EENAB
        ANDA    #EENOF
        STA     EENAB
        PULS    A,PC
```

Sound Subroutine

Sound is actually caused by writing a series of different values to the DAC The PITCH depends upon the frequency or time between changing the values the longer the duration the lower the pitch The VOLUME emitted depends upon the *difference* between the consecutively written values the greater the difference the louder the noise the loudest being created by writing 0 and 63 alternately Thus a value of 20 followed by a value of 25 gives the same **loudness** as writing a value of 0 then 5 or 58 then 63 The DAC is address location $FF20

Only 6 of the 8 bits of the DAC byte are used in creating sound hence the range of values being 0-63 thus

7 6 5 4 3 2 1 0 bit number

128 64 32 16 8 4 2 1 bit value (decimal)

x x 1 1 1 1 1 1

value 63 ($3F)

However the six bits used for sound in the DAC byte are not bits 0-5 but 2-7 Furthermore bits 0 and 1 are used by the Dragon for other things and must not be altered by our routines The source code to do this is as follows the actual value being set up for the routine in Register A (object code $6DA1-$6DB4)

```
***** make sound in Reg A *****
SOUND   PSHS    A
        ASLA
        ASLA
        PSHS    A
        LDA     EDAC
        ANDA    #$03
        ORA     ,S
        STA     EDAC
        LEAS    1,S
        PULS    A,PC
```

The PITCH SUBROUTINE is quite simply a DELAY LOOP (ie FOR N=1 to 500 NEXT) It is the time to be idled away before writing the next value to the DAC The longer the delay, the lower the pitch of the current sound being made The source to do this is as follows the delay count being set up for the routine in Register B (object code $6DB5-$6DBB)

```
***** pitch (delay=Reg.B) *****
PITCH   PSHS    B
PITCHD  DECB
        BNE     PITCHD
        PULS    B,PC
```

Listing 2

Figure A

```
1 REM HEXLOADER WITH CHECKSUM
2 REM PAM D AACY (C1 1904
3 CLEAA200,28001·B=10
4 PA=128:PS=193:PC=131+(B*21
5 DIM H(B*21,M(B1
6 CLS:PRINT"HEX LOADER PROGRAM':PRINT
7 INPUT"START ADDRESS";A
8 IF A=0 THEN END
9 CLS:C=0:E=0:PE=PS:P$=CHR$(128)
10 PRINT@PA,A;'(#";HEX$(A1,"1"
11 PRINT@PC,"CHKSUM"
12 IF E=0 AND PE=PS+(B*21 THEN 30
13 IF E<>0 THEN PRINT@PS+E,""
14 PRINT@PE+E,P$:S=PE-PS
15 K$=INKEY$:IF K$="" THEN15
16 IF S=B*2 THEN22
17 IF K$<"0" THEN22
18 IF K$<":" THEN K=VAL(K$):GOTO21
19 IF K$<"A" THEN15
20 K=ASC(K$)-55:IF K<10 OR K>15 THEN24
21 H(S1=K:PRINT@PE,K$;:K$="":PE=PE+1:GOTO12
22 IF K$=CHR$(12) THEN6
23 IF K$=CHR$(8) AND S<>0 THEN PE=PE-1:GOTO12
24 IF E=0 THEN21
25 IF K$=CHA$(09) THEN S=B*2 THEN 29
26 IF K$=CHR$(091 THEN PE=PE+1:GOTO12
27 IF K$=CHR$(131 THEN31
28 IF K$="S" THEN PE=PS+(B*2) ELSE GOTO12
29 PAINT@0,"":PRINT@PS+E,"'
30 PRINT@PE,"":PRINT@PE,"';:INPUT C
31 N=0:FOR S=0 TO B-1
32 H(S1=(H(S+S1*161+H(S+S+11
33 N=N+H(S1:NEXT S
34 IF N<>C THEN37
35 FOR S=0 TO B-1
36 POKE A,H(S1:A=A+1:NEXT S:GOTO9
37 PRINT@0," CHECKSUM ERROR - EDIT"
38 PRINT@PS+(B*21,"';
39 E=32:PE=PS.P$=CHR$(941:GOTO12
40 REM**************************
41 REM OVERALL CHECKSUM CHECK
42 T=0:FOR N=28001 TO 28320
43 T=T+PEEK(N):NEXT N
44 PRINT T:END
45 REM**************************
46 REM RECHECK LINE CHECKSUMS
47 N=28001
48 T=0:FOR N=N TO N+9
49 T=T+PEEK(N):NEXT N
50 PRINT N-10,T
51 K$=INKEY$:IF K$="" THEN51
52 IF K$="A" THEN RUN ELSE48
```

The NOISE SUBROUTINE makes SOUND in Register A with PITCH in Register B). Pitch is needed quite often but not always, which is why SOUND is supplied as a separate routine. The NOISE routine simply calls both SOUND and PITCH subroutines. Source (object code $6DBC-$6DC0)

```
** make sound(A) with pitch(B) *
NOISE   BSR    SOUND
        BSR    PITCH
        RTS
```

Having put these sounds together, even I cannot understand why they actually sound as they do. Apparently, a lot of it is to do with the ear making what it can of the air waves sent to it — the air waves being altered by the values written to the DAC (which causes changes in its voltage) and the rate at which the values are written. I suggest that if your understanding of sound is as non-existent as mine, you too simply experiment with values until you come up with something that sounds right to you.

My version of **LASER ZAP** is created by repeating the same **loudness** of noise by writing a pair of values alternately (in this instance the loudest possible, 63 then 0) but increasing the **duration** from 1 (LDB #1) by 1 (INCB) between the repetitions, thus smoothly lowering the pitch. I end the sound when the duration count reaches 200 (CMPB #200). Experiment yourself with loudness and pitch and you may find a ZAP that you like better. Source (object code $6DCB-$6DD9)

```
********************************
*********** LASER **************
********************************
LASER   LDB    #1
LASERL  LDA    #63
        BSR    NOISE
        CLRA
        BSR    NOISE
        INCB
        CMPB   #200
        BNE    LASERL
        RTS
```

I don't know the official definitions of laser zap or phaser noises, but to me sounds that I have heard described as phasers seem simply to be more or less a repetitive whippier type of zap. For fuller appreciation, the routine repeats the sound cycle five times (LDY #5). You may like to vary this value.

My version of a phaser runs through a cycle of gradually reducing volume levels, starting at the maximum (PHASEB LDA #63), decreasing by 1 (DEC VLEVEL,PCR) until a starting level of zero is arrived at. Duration (=pitch) is not used. Instead, after writing the starting volume to the DAC, that individual sound is modified by writing a further series of values to the DAC, the series being the start volume level (PHASEC BSR SOUND) reduced by 1 (DECA) until it reaches zero. Different types of phasers can be achieved (fast/slow/loud/quiet) by varying values. Source (object code $6DDA-$6DF5) **(Figure B)**

```
********************************
********** PHASER **************
********************************
VLEVEL  FCB    0
PHASER  LDY    #5
PHASEB  LDA    #63
        STA    VLEVEL,PCR
PHASEC  BSR    SOUND
        DECA
        BNE    PHASEC
        DEC    VLEVEL,PCR
        LDA    VLEVEL,PCR
        BNE    PHASEC
        LEAY   -1,Y
        BNE    PHASEB
        RTS
```

Figure B

Fig A

USING THE HEX LOADER PROGRAM (HEXLOADR) (Listing 2). The program assists in speedy but accurate entry of machine code data by use of a CHECKSUM after every 10 bytes. It also contained an EDIT facility so that a whole line of data doesn't need to be re-entered because of an odd typing slip. Any amount of data may be entered in one session, allowing you to pick up and put down programme entry as suits your mood or convenience. Type in the program and save it. RUN.

Input the starting address for the code to be entered — 28001 or the restart point if continuing from a previous session. Input each line of the hex dump (listing 1) as a stream of 20 consecutive hex characters (0-9 A-F). The space character between each pair of hex characters (=1 byte) is for easier reading and checking and is not to be typed in.

After entering the last pair of characters in a line, the checksum is typed in and <ENTER> pressed. If the data entered agrees with the checksum, the values are POKEd into the designated memory locations and the screen prompts the next address. Pressing <CLEAR> at any time abandons any current line being entered and returns you to the START ADDRESS screen. Enter an address of zero to terminate the program.

Should the checksum check fail, EDIT mode is entered, allowing you to use the left and right arrow keys to position the editor's up arrow marker below any offending characters and to overtype them with correct values. <S> instantly positions you at the checkSum value should that be where the error lies. When editing is complete, press <ENTER> for the line to be rechecked again etc.

At any time that you wish to cease program data entry, mark listing 1 to indicate the restart point. Save the code (CSAVEM SND1etc 28001 28320 28001). Strictly speaking, you need only to save the data entered so far, but always using the final CSAVEM command helps avoid unwitting errors.

When you wish to continue programe data entry, reserve machine code memory (CLEAR200 28000), CLOADM the last saved disassembler program data file, CLOAD the BASIC hex loader program, RUN and input the marked restart point as the start address etc.

Once the program data is fully entered, as a further precaution, particularly if loaded over more than one session, check the overall checksum by exiting from the hex loader and type in RUN42<enter>. This will tot up the values in locations 28001/28320 inclusive and display the total. The overall checksum is 36405. If it does not agree, RUN47 will proceed to tot up and display each line's checksum total. In this phase, once you spot a discrepancy, <R> will re-RUN the hex loader program (press any other key to continue the tot up process).

Once a clean bill of health is confirmed, save the program: CSAVEM SOUNDBOX 28001 28320 28001

Hex loader adjustments

Adjust the hex loader CLEAR (line3) and checking routines addresses (lines 42,47) if you wish to set up the program data at a lower address (you can always adjust its final loading position by CLOADM with offset and CSAVEM from that point once the program has been entered).

HEXLOADR may be of use for other similarly set up hex dumps — but they may not be 10 bytes per checksum. Adjust B=10 (line3) as appropriate — the program will cope with a maximum of 13 bytes per line without needing further amendment. Should the checksum value be given in hex (this dump has a decimal value), it can be entered using the standard BASIC facility (as can starting addresses presented in hex) of prefixing it with &H.

Explosions tend to sound ragged or crackly to the ear and they tend to fade away over the duration. You could set up your own crackly sound value sequence that decreases in volume as it progresses, but a popular idea is that of using a chunk of fairly random values in the Dragon memory — and where better to find a mass of readily available assorted values than program instructions — notably the BASIC INTERPRETER (ROM), which is always there?

The following program — BASIC ROAR — will give a noise akin to the sheet of crackly sound heard when moving a TV or radio tuner between stations. This is known as white noise. The sound generated by the BASIC ROAR, for all practical purposes, can be termed white noise, although the purists will disagree. It is an excellent basis for explosions.

I have started from ROM address $8000 (ROAR LDX #EROAR), given each sound a duration of 20 (LDB #20), continuing until address $C000 (CMPX #EROARE) is reached. You may well realise that the potential maximum value contained in a byte is 255, so the maximum volume of 63 may be exceeded. The SOUND routine lops off the two most significant bits of the value passed to it in Register A when it repositions bits 0-5 to bits 2-7 for the DAC byte, so a maximum value of 63 is still written. This may be used to good effect deliberately in creating sounds by running through a series that exceeds 63 (after 63 the next value will be 0 etc). Source (object $6DF6-$6E04)

```
*********************************
******** THE BASIC ROAR ********
*********************************
ROAR    LDX    #EROAR
        LDB    #20
ROARD   LDA    ,X+
        BSR    NOISE
        CMPX   #EROARE
        BNE    ROARD
        RTS
```

The fade of an explosion is known as noise decay. What we need to do is to ensure that the maximum volume at any one time is in line with the decay required, be it fast to start then gradual or whatever

This example gives a simple but effective steady decay over the 16K of the BASIC ROAR ($8000-$C000)

Technically what is needed is to lop the tops off the spikes of volume that exceed the maximum volume (=difference between consecutive values written to the DAC) of the DECAY LINE

The easiest method although if you work out *precisely* what happens you will see that it may actually reshape a sound is to apply a logical AND mask of the current maximum permissible volume (is as per the decay line) prior to making each sound. This will ensure that even if the previous value written was zero and the next one is 63 or greater, only the maximum permissible sound at that time will actually be output

Back to the ROAR the volume range is 64 (0-63) so if we divide the 16K by the maximum available steps in volume (1024★16 /64) we need to reduce the permissible volume level after every 256th sound made. The AND mask starts at 63 (EXPLOD) subsequently being reduced (DEC)

Rather than introduce extra count bytes the current ROM address itself is used to determine when 256 bytes have been written — as the address starts at a 256 byte boundary every 256th byte written will have an address with the least significant byte=0 (try it) hence the source TFR X D/ANDB #$FF/BNE EXPLOK. The pitch or duration of 20 is retained. Source FADE ROUTINE (ANDs the value in Register A with the current fade (VFADE PCR) mask before calling NOISE) — object code $6DC1-$6DCA

```
**** fade the noise in Reg.A ***
VMASK  FCB    0
FADE   PSHS   A
       ANDA   VMASK,PCR
       BSR    NOISE
       PULS   A,PC
```

EXPLOSION WITH FADE (object code $6E05 $6E21)

```
*********************************
****** EXPLOSION WITH FADE *****
*********************************
EXPLOD LDA    #63
       STA    VMASK,PCR
       LDX    #ERDAR
EXPLOG LDB    #20
       LDA    0,X+
       BSR    FADE
       TFR    X,D
       ANDB   #$FF
       BNE    EXPLOK
       DEC    VMASK,PCR
EXPLOK CMPX   #ERDARE
       BLO    EXPLOG
       RTS
```

GUNSHOT can be created by a short explosion sequence with or without fade as preferred by you. My version commences with a single burst at the highest volume and fades the noise after every four writes to the DAC ending when the fade mask is zero. The sound is given a duration of 25. Please excuse the unnecessary second LDA #63 — it doesn't seem worth the effort of reprinting everything and changing addresses within the article for such a small point — but I mention it as the hawk-eyed readers of *Dragon User* are bound to comment!

Experiment yourself until you have found a gunshot that you are happy with. Source (Object code $6E22 $6E45)

```
*********************************
****** GUNSHOT WITH FADE *******
*********************************
GUN    LDX    #ERDAR
       LDA    #63
       STA    VMASK,PCR
       LDB    #20
       LDA    #63
       BSR    NOISE
       CLRA
       BSR    NOISE
GUNSHT LDB    #20
       LDA    0,X+
       BSR    FADE
       TFR    X,D
       ANDB   #$03
       BNE    GUNSHT
       DEC    VMASK,PCR
       BNE    GUNSHT
       RTS
```

The **FREQUONICS (ALARM)** routine is demonstrating mixing sounds. It shows that you are not limited to setting off a sound and waiting for it to finish before doing something else (be it further sounds or other for example graphics processing). The sound was arrived at purely by experimentation with different values for volumes and durations — I recommend you to dabble further

This offering is HARMONICS (*not* harmony). Harmonics is the production of sounds of different amplitudes or volume or loudness being output at different frequencies or repeated at different rates. To keep the sound easier on the ear, the frequencies are multiples of each other (=HARMONICS) that is

Sound 3 frequency (or pitch or delay) = 30
2 60
1 120

However as the **volumes** are not as would be expected of harmonics I have called it FREQONICS. The overall effect is of a warning background buzz with a clanging bell like alarm superimposed. Omission of the BSR FREQS3 line results in the buzzer sound alone. Source (object code $6E46 $6E9E)

```
*********************************
***** FREQUONICS (ALARM) *******
*********************************
VFREQV FCB    0
VFREQ1 FCB    0
VFREQ2 FCB    0
VFREQ3 FCB    0
FREQ   LDY    #400
       LDA    #255
       STA    VFREQV,PCR
       LDA    #1
       STA    VFREQ1,PCR
       STA    VFREQ2,PCR
       STA    VFREQ3,PCR
FREQA  DEC    VFREQ1,PCR
       BNE    FREQB
       BSR    FREQS1
       LDA    #120
       STA    VFREQ1,PCR
       LEAY   -1,Y
       BNE    FREQB
       RTS
FREQB  DEC    VFREQ2,PCR
       BNE    FREQC
       BSR    FREQS2
       LDA    #60
       STA    VFREQ2,PCR
FREQC  DEC    VFREQ3,PCR
       BNE    FREQA
       BSR    FREQS3
       LDA    #30
       STA    VFREQ3,PCR
       BRA    FREQA
FREQS1 LDA    #63
       BRA    FREQSS
FREQS2 LDA    #10
       BRA    FREQSS
FREQS3 DEC    VFREQV,PCR
       LDA    VFREQV,PCR
FREQSS LBSR   SOUND
       CLRA
       LBSR   SOUND
       RTS
       FCB    0,0
```

Simple experimentation can be speeded up if you know how to use a MONITOR. Even a few lines added to the SOUND MENU PROGRAM to allow you to input an address and POKE a new value is sufficient. I look forward to reading of your sound creations to add to my SOUNDBOX in future issues! ■

```
Listing 3      10 REM SOUND SELECTOR
               20 EA=28001:EP=EA+3
               30 CLS
               40 PRINT"SOUND SELECTOR MENU"
               50 PRINT
               60 PRINT" 1 LASER"
               70 PRINT" 2 PHASER"
               80 PRINT" 3 BAS1C ROAR"
               90 PRINT" 4 EXPLOS1ON"
               100 PRINT" 5 GUNSHOT"
               110 PRINT" 6 ALARM"
               120 PRINT" Q QUIT"
               130 PRINT
               140 PRINT"SELECT OPT1ON"
               150 K$=INKEY$:IF K$="" THEN150
               160 IF K$="Q" THEN END
               170 SN=VAL(K$)
               180 1F SN<1 OR SN>6 THEN30
               190 PRINT SN
               200 POKE EP,SN-1
               210 EXEC EA
               220 GOTO30
```

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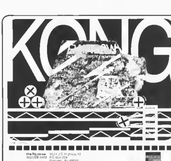

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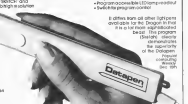

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From Vince Gledhill in Northumberland

THIS PROGRAM simulates those heart rate testing machines which are beginning to appear in a variety of shops around the country.

Like the machine it is intended for amusement only and not a serious application. The program is calibrated for the average adult's heart-rate and it should be noted that children's hearts beat faster than an adult's.

```
5 'HEARTBEAT (C) V. GLEDHILL OCT 1984
10 J$=CHR$(128)
20 J2$=J$+J$
30 J4$=J$+J$+J$+J$
40 FOR A=1 TO 5
50 CLS0
60 PRINT@106,"heartbeat";:SOUND100,2
70 FOR G=1 TO 800:NEXT
80 CLS0
90 FOPG= 1 TO 800:NEXT
100 NEXT A
110 PRINT@230,"want"J$"instructions";
120 Q$=INKEY$:IF Q$="" GOTO 120
130 IF Q$<>"Y" GOTO 360ELSE 300
140 CLS0
150 PRINT@129,"on"J$"beat"J$"twenty"J$"press"J$"the"J$"space"J2$"bar"J$"again";
160 Q$=INKEY$:IF Q$<>CHR$(32) THEN 160 ELSE 170
170 D=TIMER/50:SOUND 90,2
180 C=INT((20/D)*60)
190 PPINT@267,C
200 IF C<=60 THEN PRINT@ 358,"athletic";:GOTO 250
210 IF C>61 AND C<70 THEN PRINT@358,"well"J$"conditioned";:GOTO 250
220 IF C>71 AND C<85 THEN PRINT@358,"average";:GOTO 250
230 IF C>86 AND C<100 THEN PRINT@358,"below"J$"average";
240 IF C>=100 THEN PPINT@358,"may"J$"need"J$"exercise";
250 FOR X=1 TO 2500:NEXT X
260 PRINT@422,"want"J$"another"J$"go";
270 Q$=INKEY$:IF Q$="Y" THEN 410 ELSE 280
280 IF Q$<>"N" THEN 270 ELSE END
290 IF Q$="" GOTO 270
300 CLS0
310 PRINT@2,"this"J$"program"J$"calculates"J$"your"J2$;
320 PRINT@33,"heartrate";
330 PRINT@98,"used"J$"properly"J$"it"J$"can"J$"indicate"J2$"how"J$"fit"J$"you"J$
"are";
340 PRINT@194,"but"J$"remember"J$"your"J$"heartrate"J4$"can"J$"alter"J$"dramatic
ally"J$"after"J4$"exercise"J$"or"J$"at"J$;
350 PRINT"times"J$"of"J$"stress"J$;
360 PRINT@322,"locate"J$"your"J$"pulse"J$"and"J$"leave"J4$"your"J$"finger"J$"the
re"J$;
```

Continued on page 31

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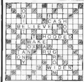

LINKWORD

The game is for 2 to 4 players, the object being to score points by forming words on the board using only the letters randomly provided in your personalised rack. The computer automatically calculates all scores for both direct and indirect word formations including double and triple letter scores, double and triple word scores, 50 bonus etc. Full cursor controls provided so that letters may be easily placed anywhere on the board. The game features bright colourful graphics with facilities for correcting mistaken spelling or exchanging difficult letters from your rack.

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Continued from page 28

```
370 PRINT"then"J$"press"J$"the"J$"spacebar"J$"and"J$"start"J$"counting"J$"the"J
$"beats";
380 O$=INKEY$:IF O$<>CHR$(32) THEN 380
390 TIMER=0:SOUND80,2
400 GOTO 140
410 CLS0:GOTO360
```

Conversion

From P Howarth in Manchester

CONVERSION is a simple program to convert numeric measurements of one form into its equivalent number in another.

This program will convert inches to centimetres, feet to metres, miles to kilometres, gallons to litres, ounces to grammes, pounds to kilograms and fahrenheit to centigrade.

```
10 REM***** P. HOWARTH *****
20 CLS
30 PRINT"WHICH CONVERSION DO YOU R
EQUIRE?";
40 PRINT
50 PRINT"(1)  INCHES - CENTIMETRES
"
60 PRINT"(2)  CENTIMETRES - INCHES
"
70 PRINT"(3)  FEET - METRES"
80 PRINT"(4)  METRES - FEET"
90 PRINT"(5)  MILES - KILOMETRES"
100 PRINT"(6)  KILOMETRES - MILES"
110 PRINT"(7)  GALLONS - LITRES"
120 PRINT"(8)  LITRES - GALLONS"
130 PRINT"(9)  OUNCES - GRAMMES"
140 PRINT"(10) GRAMMES - OUNCES"
150 PRINT"(11) POUNDS - KILOGRAMS"
160 PRINT"(12) KILOGRAMS - POUNDS"
170 PRINT"(13) FAHRENHEIT - CENTIG
RADE"
180 INPUT A
190 IF A<1 OR A>13 THEN GOTO 180
200 ON A GOSUB 260,340,420,500,575
,650,730,810,890,970,1050,1130,121
0
210 PRINT@448,"ANOTHER CONVERSION
(Y/N)?"
220 A$=INKEY$
230 IF A$="" THEN GOTO 220
240 IF A$="Y" THEN GOTO 20
250 CLS:STOP
260 CLS
270 PRINT@166,"INPUT INCHES ";
280 INPUT IN
290 LET CM=IN * 2.54
300 PRINT@197,IN;" * 2.54 = ";CM
310 PRINT@230,"CM = ";CM
320 FOR X=0 TO 15000:NEXT X
330 RETURN
340 CLS
350 PRINT@166,"INPUT CENTIMETRES "
;
360 INPUT CM
370 LET IN=CM / 2.54
380 PRINT@197,CM;" / 2.54 = ";IN
390 PRINT@230,"IN = ";IN
400 FOR X=0 TO 15000:NEXT X
410 RETURN
420 CLS
430 PRINT@166,"INPUT FEET ";
440 INPUT F
450 LET M=F * 0.3048
460 PRINT@197,F;" * 0.3048 = ";M
470 PRINT@230,"M = ";M
480 FOR X=0 TO 15000:NEXT X
490 RETURN
500 CLS
500 CLS
510 PRINT@166,"INPUT METRES ";
520 INPUT M
530 LET F=M / 0.3048
540 PRINT@197,M;" / 0.3048 = ";F
550 PRINT@230,"FT = ";F
560 FOR X=0 TO 15000:NEXT X
570 RETURN
575 CLS
580 PRINT@166,"INPUT MILES ";
590 INPUT ML
600 LET KM=ML * 1.6093
610 PRINT@197,ML;" * 1.6093 = ";KM
620 PRINT@230,"KM = ";KM
630 FOR X=0 TO 15000:NEXT X
640 RETURN
650 CLS
660 PRINT@166,"INPUT KILOMETRES ";
670 INPUT KM
680 LET ML=KM / 1.6093
690 PRINT@197,KM;" / 1.6093 = ";ML
700 PRINT@230,"ML = ";ML
710 FOR X=0 TO 15000:NEXT X
720 RETURN
730 CLS
740 PRINT@166,"INPUT GALLONS ";
750 INPUT GAL
760 LET LIT=GAL * 3.7854
770 PRINT@197,GAL;" * 3.7854 = ";L
IT
```

Continued on page 33

Wizard Software

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A colourful 100% machine code [illegible] presented in high resolution graphics. Move your man around the [illegible] of the grids but beware [illegible] chase unless you can STOP them. Nine grids are provided. Number of lives, STOPS and [illegible] are continuously displayed. One joystick required.

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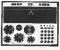

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Continued from page 31

```
780 PRINT@230,"LITRE = ";LIT
790 FOR X=0 TO 15000:NEXT X
800 RETURN
810 CLS
820 PRINT@166,"INPUT LITRES ";
830 INPUT LIT
840 LET GAL=LIT / 3.7854
850 PRINT@197,LIT;" / 3.7854 = ";G
AL
860 PRINT@230,"GAL = ";GAL
870 FOR X=0 TO 15000:NEXT X
880 RETURN
890 CLS
900 PRINT@166,"INPUT OUNCES ";
910 INPUT OZ
920 LET G=OZ * 28.35
930 PRINT@197,OZ;" * 28.35 = ";G
940 PRINT@230,"GRAMMES = ";G
950 FOR X=0 TO 15000:NEXT X
960 RETURN
970 CLS
980 PRINT@166,"INPUT GRAMMES ";
990 INPUT G
1000 LET OZ=G / 28.35
1010 PRINT@197,G;" / 28.35 = ";OZ
1020 PRINT@230,"OUNCES = ";OZ
1030 FOR X=0 TO 15000:NEXT X
1040 RETURN
1050 CLS
1060 PRINT@166,"INPUT POUNDS ";
1070 INPUT LB
1080 LET KG=LB * 0.4536
1090 PRINT@197,LB;" * 0.4536 = ";K
G
1100 PRINT@230,"KG = ";KG
1110 FOR X=0 TO 15000:NEXT X
1120 RETURN
1130 CLS
1140 PRINT@166,"INPUT KILOGRAMS ";
1150 INPUT KG
1160 LET LB=KG / 0.4536
1170 PRINT@197,KG;" / 0.4536 = ";L
B
1180 PRINT@230,"POUNDS = ";LB
1190 FOR X=0 TO 15000:NEXT X
1200 RETURN
1210 CLS
1220 PRINT@166,"INPUT FAHRENHEIT "
;
1230 INPUT FA
1240 LET CE=(FA-32)*(5/9)
1250 PRINT@197,"(";FA;"-32)*(5/9)
= ";CE
1260 PRINT@230,"CENTIGRADE = ";CE
1270 FOR X=0 TO 15000:NEXT X
1280 RETURN
```

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MIKE GERRARD'S ADVENTURE TRAIL

I'LL BEGIN with a grovelling apology to reader Rosalind Redwood of Bristol who I mentioned in the January issue as having problems with *Calixto Island* — she couldn't get the treasure back because the transporter disappeared when she'd bartered with Trader Jack for the keys. I dared to suggest that maybe Rosalind hadn't found the treasure after all, but some jewellery that appears earlier in the game, basing this on the fact that you need the machete from Trader Jack to find the treasure, not the keys.

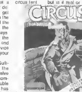
In fact, Rosalind had already done that but found, as did other readers, that a second trade caused the transporter device to disappear. So how do you get round it? Well, it seems to depend on the order in which you trade. If you find the treasure, then attempt to trade for the keys, the device goes. If you get the keys, return to open the desk and read the notes, then go back for the machete and continue to find the treasure, the device will still be there. Sorry for the slur on your status as an adventurer, Rosalind.

A letter this month from Kerry O'Sullivan, with no address but containing the proud announcement that after twelve months' hard labour Kerry too has completed *Calixto Island*, having had trouble with the professor's notes. John Martin has sorted out *Calixto Island* and polished off *Black Sanctum*, finding the latter rather disappointing, but he's now stuck in *Madness and the Minotaur*. John's problem is finding the oil for the lamp. So if you can spare clues, or even some oil, write to John at 114 Blackmead, Orton Mulborne, Peterborough, Cambs. John's also finished *El Diablero* after a lot of frustration and dead crows, he says, so maybe you can swop tips with him.

Another reader in need of help is Pauline Hampson of 10 Cherry Lane, Lawton Heath, Alsager, Stoke-on-Trent ST7 3QZ. Pauline is one treasure short in *Keys of the Wizard* and not even Microdeal can help her. She doesn't say which treasures she's found, but if anyone can help do write to her. In return Pauline can help with the dreaded *El Diablero* and *Calixto Island* and says she can recommend Channel 8's *Time Machine*.

I'm afraid I can't recommend Channel 8's *Circus* as highly as some of the others in the Mysterious Adventure series. I haven't had time or space to look at them all yet, but I loaded up *Circus* the other evening to see what it was about. The following evening I finished it without the aid of a safety net! In fact that's misleading: you do need the aid of a safety net, and a few SAVEs here and there, but with only about 33 locations it's not the hardest adventure you'll ever have to tackle.

The story is that your car has run out of petrol on a lonely country road... dear me, the mishaps that happen to us innocent adventurers. As you go trudging over the fields and roads you come across a circus tent... but is it real or haunted?



And where's the light that enables you to see inside? There's a cage containing a sleeping tiger and a tank containing a seal, so with just these two creatures and a solitary clown is it any wonder the circus closed down? Take care going up to the trapeze and the tightrope, and once you've found a source of light you shouldn't hang about as its life is limited.

The adventure sets you two main problems. One is in finding just the right words to solve a particular problem, and this to my mind is not what adventures are about. You know what you want to do, but what are the exact words the program's looking for? In *Circus* there's a chest which you know you must have to open, but after OPEN CHEST, HIT CHEST, BASH CHEST and a dozen other attempts I was about to give up. When I eventually discovered what you had to do I could have kicked the programmer.

The other problem *Circus* sets is that you only have a certain number of moves before your light runs out, and also a certain number when you get into the end sequence, so you must work out the most economic way of moving things around and solving problems. When I did it I was on my very last turn as I issued, with fingers crossed, what I hoped was the final command. By the skin of my teeth I did it, but I hoped for more than a few hours of entertainment from a £9.95 adventure. Fortunately, not all Channel 8's are so simple, and I did have a letter recently from a reader who enjoyed *Circus* a great deal, so make your own minds up about that.

Maybe I'm just in a grouchy mood this month, because I didn't like the other adventure much either! This was *Terror Castle* from Quickbeam Software, whose title *The Shrunken Scientist* impressed me last time. When I loaded up this one, though, it looked rather familiar, and sure enough it was an adventure that had been published and then withdrawn last year under the title *Horror Castle*. Your objective is to rescue a beautiful princess from said castle, so I don't know whether this will appeal to the many female adventurers I get letters from (it's the only reason I write the column!)

What won't appeal to anyone is the lack of a SAVE feature, particularly as the game takes a delight in killing you off without warning. This doesn't matter too much early on, but when you're well into the adventure you don't want to discover that you've stepped through a door and fallen 100 feet into the moat, so you have to start again. The location descriptions are very brief, with no atmosphere at all — well, how can you have atmosphere when you find in this creaky old castle a table which has a drawer requiring a combination to unlock it? The combination is on a card elsewhere, and it's typical of the lack of logic that you can't read the card in any location other than the one where the table is. Why on earth not?

I had been hoping to include reviews of the two new ones from Adventure International, *Spiderman* and *The Sorceror of Claymorgue Castle*, but the review copies haven't arrived. They'll be here next month though, if I have to trek to Birmingham cap in hand. Goodness, I might even buy them. Don't tell the editor though, or I'll be drummed out of the Reviewers' Union. ■

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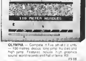

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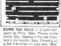

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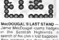

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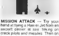

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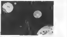

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D
DACC 32
Data Pen 21

E
Electroanalytical Technology 34

G
Gamesmanship 34
Grosvenor 34

H
Hadekel 34
Harris 27
Hot Coco 20

I
Impsoft 32
Interface 27

M
Magic Midnight 30
Micro-De Bug 21
Microdeal 6
Morrison Micros 26
MST 40

O
Oasis 2

P
Peaksoft 27 & 34

Q
Quick Beam 34
Quicksilva 34

R
R & P International 30
Rainbow 26

S
SP Electronics 34

T
Torchmaster 4
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V
Voltmace 44

W
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If you've got a technical question write to Brian Cadge
Please do not send a SAE as Brian cannot guarantee to answer individual inquiries.

Dragon Answers

Light connections

I AM trying to find out where the X and Y screen locations are kept I have built a light pen for use with the Vic but do not know how to program the Dragon to accept inputs from a light pen or even how or where to connect the light pen to the Dragon

C Tuckwood
19 Holmwood Ave
Plymstock
Plymouth

THE TEXT screen position is stored in locations 136/137. To get the equivalent print @ position, use peek(136) 256+peek(137)−1024

The graphics x co-ordinate is stored in loc 200, and the current y co-ordinate in loc 292 However, without an interface to the Dragon's cartridge port, the computer can not use light pens which return screen positions, only light sensitive ones which plug into the joystick ports

What's your number?

I AM looking for a ROM address in the Dragon Specifically I am looking for a ROM call subroutine that is called by BASIC's main command interpretation loop — the main loop calls $ (In TRS80 CoCo it is $ADC6) when it is set to execute the next command

On entry it is assumed that $A6 $A7 is pointing to the next BASIC command to be executed and that the A register contains the first byte of that command After the ROM call returns this subroutine returns program control to the calling routine with an RTS

Maarten Van Wamelen
Neth-Belg
3 Lijnmatastraat
Oedelum
4330 Belgium

THE ROM address you need to use on the Dragon is $84A7 hex or 33959 decimal This is slightly different from the CoCo routine you mention in that the "A" register need not be set up first

Locations 166/167 should be set up to point to the start of the tokenised command you wish to execute Also, note that the Dragon's tokens have different values to the CoCo's

Read between the lines

I AM the owner of a Dragon 64 Dragon Diskette station and a Microline-80 printer

When I am using the DS-9 system and trying to write a letter with the Stylograph or the Tutorial letter in the Stylograph my spacing between the lines is too big The distance between the lines is 10mm and that is too much I have tried all the Print Codes in the OS-9 but with no results

Does the Microline-80 printer not work with the OS 9 system? Besides this I have had no problem with the printer If you have any solution to this problem please let me know

I also own a TRS-80 Model I Level II, with expansion interface 32K Is it possible to use the Dragon Diskette station on the TRS-80 or do I need any particular connection I have not used it on the TRS-80 but I can see that the Dragon cable fits in the TRS-80

John Hagen
Lyngfaret 72a
5071 Loddefjord
Bergen
Norway

IT SOUNDS to me as if your printer is leaving a blank line between each printed line This is caused by DS-9 outputting both a CR and LF code at the end of each line You can get over this by altering the dip switches to your printer if possible, or alternatively use the following procedure in DS-9 xmode /p −lf (to stop autoline feeding)

From Stylograph spool the output to a file, such as /dD/print then from OS-9 type copy /dD/print /p

To your second question TRS-80 drives can be used with the Dragondos or Deltados controllers However, don't try to use any other interface, such as the Coco disk controller, as these will not work

I can't get no satisfaction

I HAVE been having trouble getting the commands GET and PUT to work I have written a program which requires a star to move left and right across the screen but I have been unable to achieve this I have enclosed the program and would be grateful if you could have a look at it and tell me where I went wrong

```
10 PMODE 4 1:SCREEN 1 1 PCLS
20 A$ = "BM5 5 C0 R5 C5 F5E5D5
   R5G5F5L5D5H5G5U5L5E5H5R5
   U5
30 DIM B(35 35) DRAW A$
40 C=3 D=3
50 GET (C D)−(C+35 D+35) B
60 C=C+1
70 PUT (C D)−(C+35 D+35) B,PSET
80 GOTO 50
```

J Wilson
19 Amberley Rd
Stoke Lodge
Patchway
Bristol BS12 6BK

THE GET and PUT commands seem to cause more than their fair share of trouble to users learning Basic The problem with this program is that the G is missing in the GET statement This should read GET(C,D)−(C+35 D+35) B G

The manual states that the G (which instructs full graphical detail to be stored) is optional but in practice it is usually wise to include it, else the image displayed by PUT can be somewhat unpredictable There is no need to GET an image more than once, so line 80 can be changed to GOTO 60

Don't hang up on me

I SEEM to be having problems with the printer port When I poke data to 65281 2 (which appears to be the printer port) the system "hangs up" This also occurs using LLIST I am using a "Paper Tiger" centronics interfaced printer

Could you tell me the correct address for I/O ports (cartridge and printer)? Is the printer port a 6821 PIA "B" port?

D Coombes
28 Buckland Gdns
Calmore
Hants SO4 2SB

THE PRINTER port is addressed as location 65282 only Poking data to location 65281 is likely to cause the machine to crash or at least the keyboard to stop operating If the machine hangs up when you use LLIST then it sounds as if the printer "busy" connection is faulty Try typing ?PEEK(65314)AND1 which should print a 1 if the printer is ready If you get a zero with the printer connected then the "busy" input is not working

The printer port is a 6821 PIA "B" port

Error - what error?

USING THE following short program to PEEK through the Basic ROM I came across the statement EXTRA IGNORED at locations 34842 to 34854 Is this an error message?

```
10 FOR A-32768 TO
   49151 B=PEEK(A)
20 IF B 731 AND B 127 THEN PRINT
   CHR$(B)
30 NEXT A
```

S Moore
7 Birch Ave
Grimsby
South Humberside

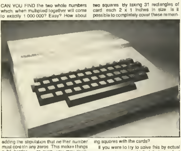
THE "EXTRA ignored" message is generated when too many items are entered in an input statement For example if you enter 2 3 (enter) when the input command reads INPUT A this message will be displayed Unlike other errors it is only a warning and the program does not stop

Unfortunately, this is not mentioned in the explanation of the input command in the manual or in the errors section

Answers to Competition Corner,
Dragon User, 12-13 Little Newport
Street London WC2H 7PP

Four Dragon 64s to be won

CAN YOU FIND the two whole numbers which, when multiplied together will come to exactly 1 000 000? Easy? How about



adding the stipulation that neither number must contain any zeros This makes things a bit harder — or even you may think impossible That is unless you happen to hit upon a novel method of approach whereupon the solution becomes simplicity itself

One million is equivalent to 10 raised to the sixth power — that is 10^6 Now 10 as well as having factors of 10 and 1 also has factors of 2 and 5 so just as 10^6 equals one million so too does $(2 * 5)^6$ This can also be written as $2^6 * 5^6$ which works out as 64 times 15 625 Thus we arrive at our answer to two factors of one million neither containing any zeros

Puzzles of this type in which the solution is readily apparent but only if you hit upon such a lateral method have become known by the not inappropriate name of aha problems It was for much the same reason that the concealed sunken fences popular with landscape gardeners such as Capability Brown and his contemporaries were called ha has mainly due to the expression of surprise when encountered for the first time

Here is another aha of the mathematical kind Draw an eight inch square and rule it up into a grid of sixty-four one inch squares Now cross out two diagonally opposite corner squares so leaving sixty two squares By taking 31 rectangles of card each 2 x 1 inches in size is it possible to completely cover these remaining squares with the cards?

If you were to try to solve this by actual experiment you might find that your first few attempts failed By the time that you had had a couple of dozen tries — also equally fruitless — you might reasonably suppose that the solution was difficult if not impossible But how can it be proved? Of the millions of different ways in which the cards can be placed is there not *one* that will succeed in covering all the squares?

The answer is that it is impossible and the solution is beautifully simple Consider the grid to have alternate squares shaded like a chessboard If this is done the two missing squares will be both of the same colour either white or black Now a 2 x 1 card can only cover one square of each colour however it is placed and once thirty of them have been positioned the two uncovered squares will be of the same colour, and so cannot both be covered by the remaining card

Now let s return to our original problem We have seen how two factors of 10^6 can be found neither containing any zeros Are there any other powers of ten that can be similarly expressed? Ten itself has factors of 2 and 5 and one hundred has factors of 4 and 25 In each case these factors are found by simply raising 2 and 5 to the corresponding power to which we have raised the 10 The results are shown as follows

$10^1 = 2^1$ times 5 = 2 times 5
$10^2 = 2^2$ times 5^2 = 4 times 25
$10^3 = 2^3$ times 5^3 = 8 times 125
$10^4 = 2^4$ times 5^4 = 16 times 625
$10^5 = 2^5$ times 5^5 = 32 times 3125
$10^6 = 2^6$ times 5^6 = 64 times 15625
$10^7 = 2^7$ times 5^7 = 128 times 78125

Unfortunately 5^8 is equal to 390625 which as it contains a zero is not admissible and so 10^8 cannot be so factorised

This month's competition is to determine how many other powers to ten have two factors which do not contain zeros

As a hint and to save any sleepless nights it has been established by a computer in America that all powers of 2 from 2^{166} to 2^{57134} contain at least one zero so we need only concern ourselves here with powers up to 100

Prize

THIS ISSUE Compusense is giving away four Dragon 64s to four lucky winners of this competition

Rules

TO WIN a Dragon 64 you must both show the answer to the competition and how to solve it with the use of a Basic program developed on your Dragon Please do not send in a cassette containing the answer. As a tiebreaker complete the following sentence in 15 words or less I would like to own a 64 because

Your entry must arrive at *Dragon User* by the last working day of April The winners and the solution to the puzzle will be published in our July issue Entries will not be acknowledged and we cannot enter into correspondence on the result.

January winner

THE CENTRES of the discs should be 2 74233253 inches apart (approximately) The 10 winners, who will each receive six games from Cable Software are A Clarke of Wirral, Kevin Desmond of Cork, Boris Leblanc of France, Janice Parry of Wales, Gordon French of Northampton, J Wyver of Woking, I Jolley of Devon, Dominic Bradrick of Tewkesbury J Promil of Belgium and C Dacre of Preston

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Please note: **RETURN OF THE RING** is a complete adventure. You need not buy **THE RING OF DARKNESS** to play it.

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